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IN ITS 75th YEAR

January 31 1959

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NOTES of the WEEK

Business Influence

BUSINESSMEN must exert what influence they can to correct defects due to the economic system or to politics. This statement might be thought to be one made by Mr. Mikoyan during his recent US tour, during which he was reported as, to all intents and purposes, talking directly to businessmen 'over the Government's head.' It was, in fact, made by an American businessman, Mr. Philip Cortney, chairman of the US Council of the International Chamber of Commerce, addressing the Canadian Chamber of the International Council in Montreal. Such activities, went on Mr. Cortney, should apply particularly to the cause of freer international trade. It is beginning to be said that action by businessmen (although the FBI has already done much in this line) should play a larger part in new moves towards Britain's entry into the European Common Market. Some of the more farsighted are saying that the OEEC countries, the UK and the Commonwealth countries would together comprise a common market with truly magnificent potentialities not only for Britain but for all concerned. Such a plan, boldly carried through, could bring about a trade boom to outdo all previous booms put together both for size and duration. It is, after all, a truism that rising standards of living—the result even if not exactly the primary aim of increased exports—bring a desire for ever higher standards; another definition of expanding markets.

Competition

UNDOUBTEDLY such a widespread common market as envisaged above would mean greatly increased competition both here and abroad for UK manufacturers. Equally, undoubtedly, the rubber and plastics industries not excepted, British manufacturers of raw materials and finished goods would meet and master the challenge. Competition is already on the increase both as to pace and type. In export markets, for instance, terms are getting longer, some think so long as to be getting almost out of hand, but competition must be met on as broad a front as possible. In this country, in the case of some plastics raw materials, included among those denied the benefit of Key Industry Duty by the recent Tribunal decision, three months' credit is now available where previously it was quite a bit less. Again, the sales of a growing number of raw materials are being backed by more and more after-sales services. Laboratory service and technical service schemes are clearly becoming increasingly comprehensive as sales executives slip into top gear and reach for over-drive. It is the professed belief of our Western World that competition is stimulating, which is just as well for, eventually, the 'motorways' of trade and commerce must stretch in all directions—and be two-way. At the same time, as the recent frost fiasco on the new Preston road showed, it pays to have a good foundation, and that cannot always be hurried.

Redundancy

SOME local employment committees are doing good work in a direction which certainly calls for close attention nowadays. The word 'redundancy' describes a state of things which is bound to increase, not necessarily because of a rise in the unemployment figures but particularly because of the spread of automation and the need to cut out overlapping and wasteful services and processes, where they occur, in face of fast-growing world competition. When and where the discharge of workers becomes unavoidable, the resultant upset can be greatly reduced if not smoothed away altogether by the representatives of the workers and the employers taking a certain course, which, in fact, the employment committees in question describe and recommend. The first move, it is suggested, should be with the employers. Directly discharges become inevitable they should contact their local employment exchange manager and give him as much detailed information as possible about what is pending. The exchange will then interview each affected worker and record his qualifications and experience. It is often mutually convenient for this to be done at the employer's premises, to avoid undue interference with the day-to-day work. If only a few workers are affected, some exchanges are now prepared to keep their doors open, for interviews, after the normal working hours. Where no vacancies are notified, employers in the field are canvassed. A further point is that if an employee is willing to take work temporarily away from his home area, financial help is given in suitable cases.

NEWS *Briefs*

CANADIAN POLYMER BUDGET — NEW ZEALAND IMPORTS — PORTUGUESE FACTORY — NEW US PETROCHEMICAL PLANT — PAKISTAN RUBBER

●**United States** — A new petrochemical plant, costing $7.5m., is to be built this year by the American Chemical Corporation, jointly owned by Richfield Oil Corporation and the Stauffer Chemical Company. The new plant will be sited near Richfield's refinery in Watson, California.

●**Austria** — Ten thousand tons of asbestos will be exported to Austria by Russia during 1959, under the long term trade agreement between the two countries signed in October 1957.

●**Japan**—Orders for glass fibre manufactured by Glass Yarns and Deeside Fabrics Ltd., Camberley, Surrey, have been placed by Japan, latest to join the list of foreign countries to which the company exports.

●**Canada**—A 1959 capital budget of $6,660,000 for Polymer Corporation Ltd., Sarnia, has been tabled in the Canadian House of Commons. It includes $3,820,000 in new projects, among them $1,675,000 for improvements to present production units and $910,000 for a new butadiene plant. The budget, approved by the Cabinet on January 12 compares with an estimated $6,120,000 in capital expenditures for 1958. The new budget earmarks $1,944,000 to continue previously budgeted projects, and another $896,000 for contingencies.

●**Greece**—A protocol to the Trade and Payments Agreement of July 1956 between Greece and Poland, signed in Warsaw in October 1958, provides for the exchange of a number of goods including 1,500 tons of transparent wrappings of plastic material to be exported by Greece.

●**United States**—American Enka Corporation has agreed to purchase the business of William Brand and Co. Inc., of Willimantic, Connecticut, producer of diversified types of plastic covered wire and cable, according to a joint announcement by the presidents of the companies.

●**New Zealand**—Imports of thermoplastic and thermosetting resins into New Zealand during 1957 were valued at £1.7m., according to recent Board of Trade figures.

●**Portugal**—The first factory in Portugal to engage in the manufacture of synthetic resins, was opened at Mata de Charneca, Mem Martins, near Lisbon, during November. The firm, partly British owned, is called Resintela—Resinas Sinteticas Lda.

●**India** — A consortium of three prominent US rubber manufacturers is reported to be studying the possibility of setting up a factory for the manufacture of 20 to 30,000 tons of synthetic rubber per year in India.

●**Australia**—A new asbestos treatment mill went into operation in Western Australia in June last year, the Board of Trade states. This is expected to raise asbestos production from 13,000 tons annually to 20,000 tons or more. Exports in 1957 were valued at £A1,200,000, as against £A721,000 in the year before.

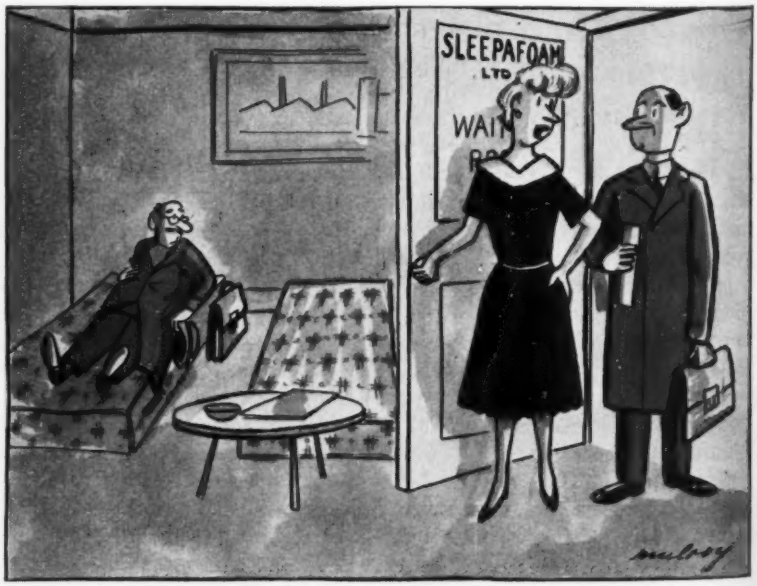
●**Pakistan**—Rubber and rubber products valued at US$2.100m. are on the list of proposed imports into Pakistan under the commodity import programme for 1959 financed by the United States International Co-operation Administration.

●**Kenya** — Tubes of rubber solution, formerly imported from Britain, are being produced by a Dunlop subsidiary, Terco, in Nairobi, according to a Barclays Bank, DCO, report. Raw Uganda rubber is used and a maximum output of 22,000 tubes a day is supplying East African demand and an export market is now being sought.

HAPPY BIRTHDAY

Birthday greetings to Mr F. D. Wayre (Dexine Rubber and Ebonite Ltd.) for February 3; Mr S. B. Simcox (Fort Dunlop) and Mr D. A. Dryburgh (K. W. Chemicals Ltd.) February 4; Mrs Bessie Lewis (director, Rubber Improvement Ltd.) February 7; Mr G. W. Stevens (Lintafoam Ltd.) February 9; Mr A. V. West (director, Lintafoam Ltd.) February 10; Mr L. Lipton, February 16; Mr C. Mann (director, Guthrie and Co. Ltd.) February 18; Mr G. E. Bermingham (Castle Rubber Co. Ltd.) February 20; Mr E. P. B. Edwards (Sutcliffe Moulded Rubber Co. Ltd.) February 24; Mr E. N. Crump (P. B. Cow and Co. Ltd.) and Mr S. Mason (A. Mason (Rubber) Ltd.) February 26; and Dr Henry P. Stevens, February 28.

∴Duly authenticated dates for inclusion in this feature will be welcomed by the Editor.



'If you'll take a mattress for a few minutes, Mr Clutterbuck will see you'—424

Flow Properties

OF RUBBER/BLACK BATCHES

By Z. RIGBI
(Rubber Research Association, Haifa, Israel)

WHILE the influence of the quantity and type of carbon black mixed into natural rubber under standard conditions has been studied exhaustively, it has not been possible in these studies to differentiate between the flow properties of the components of the mix and those of the mix as a whole. Thus, while it is known that 'structure' of FEF black influences the flow of a mix, it is not obvious from the literature whether the effects obtained are due only to the chain-like formation of black particles only, or to the interaction between the rubber matrix and the black.

In order to gain some insight into the matter, a series of experiments was planned in which natural rubber/black mixes were to be milled until they reached a uniform Williams' plasticity number. These uniform mixes were then to be studied.

In the course of the work, additional information of interest was discovered, and the scope widened accordingly. This report summarizes the results obtained.

1. *Compounding.* The following mixes were prepared from blended RSS 3 smoked sheets and blended Polymer Corporation Butyl 101 as the case may be.

Mix No.	*Elastomer*	*Black*	*Proportion black (phr)*	*Softener*	*Test temp.*
623	NR	SRF (Sterling S)	45	4 Soft bitumen	50°C.
624	NR	FEF (Sterling So)	45	4	
625	NR	HAF (Vulcan 3)	45	4	
626	NR	EPC (Spheron 9)	45	4	
681A	Butyl 101	SRF	60	—	95°C.
681B	Butyl 101	FEF	60	—	
681D	Butyl 101	EPC	60	—	

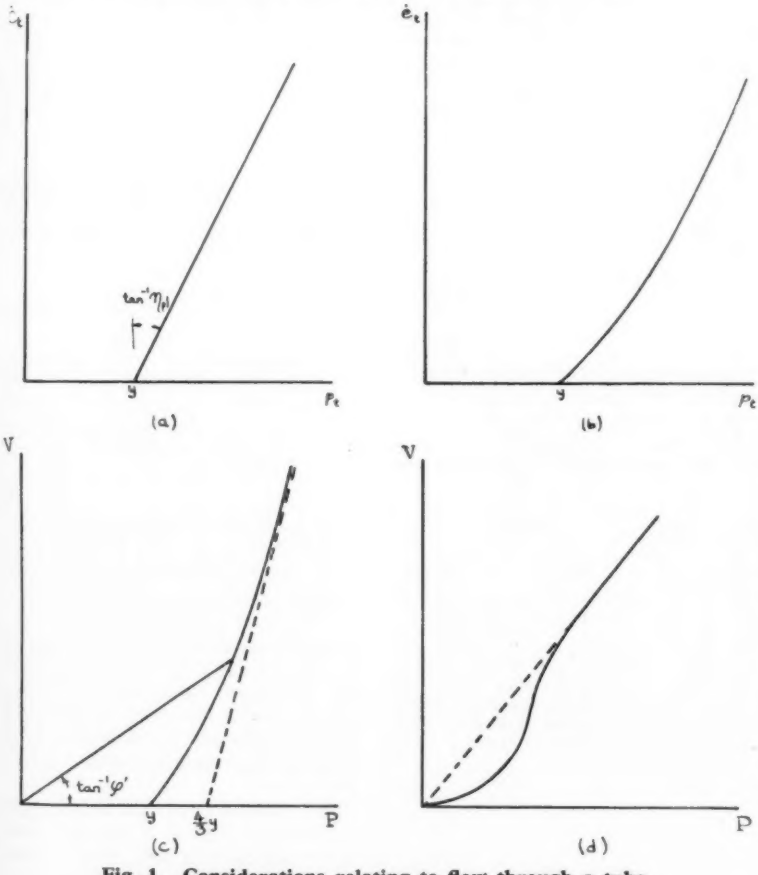


Fig. 1. Considerations relating to flow through a tube
(a) Theoretical plastic with yield stress y
(b) Probable flow curve for real plastic
(c) Extrusion of theoretical plastic
(d) Ostwald flow curve for material with structured viscosity

The higher loading of the butyl stocks was selected in order to avoid difficulties of swelling at the die.

All mixes were made on a 6in. x 13in. Farrel-Birmingham laboratory mill. No particular mixing scheme was used, but care was taken to ensure that the blacks were well dispersed, and slow addition and frequent cutting was practised. Twenty-four hours after mixing of the NR stocks, their Williams' plasticity was determined, and about one-third of the mix set aside. Plasticity of the butyl stocks was not taken, since the first part of the work showed that there was no interest in studying this.

Portions of the NR mixes were then masticated for 15 minutes at a time on a cold mill, and allowed to rest for 24 hours, when the Williams' plasticity was again measured. In this way, it was hoped to obtain uniform plasticities, but the operation proved too tedious, and had to be stopped when a measure of uniformity was reached between two groups of stocks. The plasticity numbers are given as follows:

WILLIAMS' PLASTICITY NUMBERS
(1/100 mm. after 3 min. at 70°C.)

	623	624	625	626
As mixed	136	177	259	276
Remilled	—	118	193	184

It was then considered possible to compare, on the basis of similar plasticities, 623 with 624R, and 624 with 625R, respectively, the suffix R indicating stocks reworked as necessary.

The butyl stocks were studied in the 'as-mixed' condition and after 20 minutes' milling in four periods of 5 minutes each on a cold mill.

2. *Some Rheological Consideration in Extrusion.* Poiseuille's law for the discharge of a (Newtonian) viscous liquid through a tube is given as:

$$Q = \frac{\pi(\Delta p)R^4}{8l\eta}$$

where Δp is the pressure difference causing the flow
R the radius of the tube

l the length of the tube
η the viscosity of the liquid

This is also frequently written as:

$$\left(\frac{4Q}{\pi R^3}\right) = \frac{1}{\eta}\left(\frac{R\ \Delta p}{2l}\right)$$

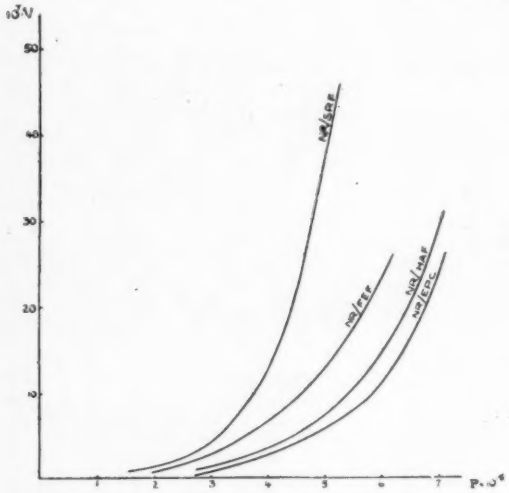


Fig. 2. Flow curves for rubber / black batches 'as mixed.' Temp. 50°C.

and the groups in brackets are termed 'consistency variables,' identified as V and P thus

$$V = \frac{1}{\eta}P = \varphi P$$

where φ is called the fluidity. Plotting results by these variables eliminates the dimensions of the extrusion equipment.

In the case of a material with a 'yield point,' *i.e.* a stress below which no flow will take place, the consistency variables are related according to the Buckingham-Reiner equation

$$V = \frac{P}{\eta_{pl}}\left[1 - \frac{4}{3}\frac{y}{P} + \frac{1}{3}\left(\frac{y}{P}\right)^4\right]$$

η_{pl} being the limiting viscosity at high rates of flow and y the yield stress.

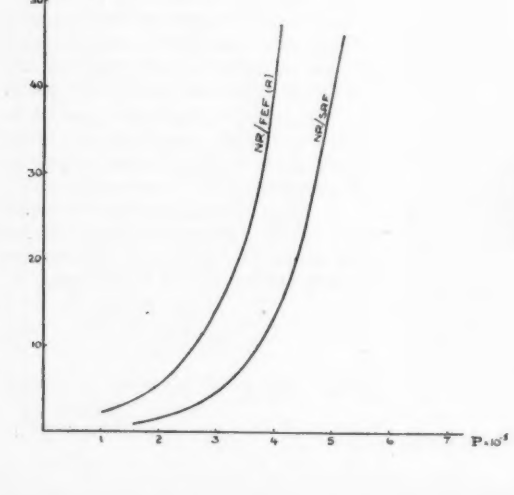


Fig. 3. Flow curves for rubber/black batches at similar Williams' plasticities. Temp. 50°C.

The general flow curve for such a material is given in Fig. 1c. It is seen that for values of P smaller than y, there is no flow.

The existence of a gel with a true 'yield point' is known, but it is highly doubtful whether a stress rate of strain curve such as shown in Fig. 1a is possible. More likely, the curve of a real material possessing a yield point is similar to that in Fig. 1b, since it is difficult to imagine a complete breakdown of all 'structure.' It is also probable that for materials such as rubber the 'yield point' does not exist at all and only appears to exist because of a very high degree of structure.

Reiner[1] analyses the flow in an extrusion plastimeter, and proves that a liquid showing 'structural viscosity'* will have a flow curve as in Fig. 1d. Defining the fluidity as P, Reiner shows that the curve must have a point of inflection, which persists when φ^1 is plotted against P. However, a plot of φ^1 against P^2 has no point of inflection. For such a material, two limiting consistencies exist—at zero flow and at high rates of shear, φ_0 and φ_∞ respectively.

Where the material possesses a yield point, moreover, there also exists an upper limit to viscosity, since

Fig. 4. Flow curves for rubber/black batches at similar Williams' plasticities. Temp. 50°C.

$$\varphi^1_\infty = \frac{1}{\eta_{pl}}\left[1 - \frac{4y}{3P} + \frac{1}{3}\left(\frac{4}{P}\right)^4\right]_{P\to\infty} = \frac{1}{\eta_{pl}}$$

When a power law such as

$$V = aP + bP^3 + cP^5$$

is applicable to the flow (even indices cannot exist in such an expression) it can be shown that for any power higher than 3, there will be no upper limiting value of φ^1, and φ^1 will rise at an increasing rate when plotted against P^2.

It is almost obvious that an upper limiting value of φ^1 must exist, but, with reference to the results given

* 'Structure' is used throughout this paper in the rheological sense. This may or may not have any relation to the structure as used in carbon black technology.

later, this may be very much greater than the values of φ^1 determined. Another mechanism, small compared with the ones being observed in one range, may operate over another range, and impose the necessary limit.

In plotting the variables V and P, it must be stressed that these are applicable no matter what laws govern the flow, and allow the marking of points obtained from experiments with extrusion plastometers of different dimensions on one chart.

The consideration discussed above will be seriously disturbed by slip, if it were to appear at any given point. The possibility that slip does occur in an extrusion plastimeter at high

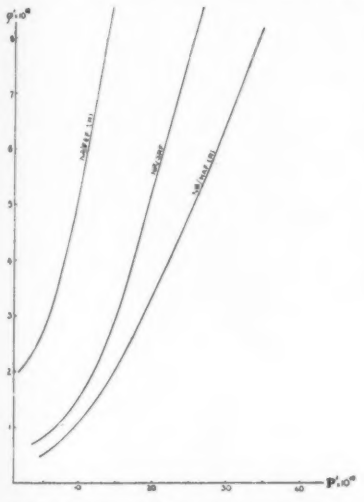


Fig. 5. Temp. 50°C. Apparent fluidity as a function of P^2. No upper limit is apparent

stresses, has been considered by Hine,[2] who finds that there is no evidence for or against slip. A re-examination of his results, however, indicates that there is no slip even at shear stresses of 2 Kg./sq. cm., and that the effects noted by Bulgin and quoted by Hine are due to an intrinsic property of rubber.

In studying these effects, the plot of φ^1 against P^2 is an extremely valuable representation because:

(a) It enables us to determine whether an upper limit to φ exists in the range of the experiment.

(b) It enables us to determine the real existence of a yield point (any positive value of φ^1 at $P^2 = 0$ means that a yield point does not exist).

3. *The Atkinson-Nancarrow Plastimeter.* This is a small extrusion plastimeter capable of large variations in rate of shear and pressure, normally used as an attachment to the Hounsfield Tensometer. It is fully described in the manufacturer's leaflet.[3]

Because of the nature of the material being studied, the bronze cylinder was given a hard-chrome plating, and after the first series of experiments it was found necessary to lengthen the extrusion tube slightly.

The instrument suffers from several defects, which may become quite serious. The control of the temperature by means of a Sunvic TYB Energy controller is difficult, and it is felt that even a thermostat and relay would not be sufficient for the purpose, since the flow itself causes temperature rises which have been measured by other workers and found to be of the order of 10 to 15°C. under some conditions. Furthermore, the friction between the guides of the plunger may introduce an error which is difficult to eliminate, but should be constant, at least during one experiment. Its value has been roughly estimated as 3 Kg., and corrections have accordingly been made in the readings.

The range of the instrument is quite wide. Loads ranging from zero to 500 Kg. are easily applied to the plunger, the latter figure being equivalent to a maximum shear stress of about 10^6 dynes/sq. cm., but at this stress the rate of shear is so great that reading cannot reach stable values before the instrument is emptied of the material under test. As will be seen, it appears that a region of interest occurs at the higher end of the range and, as the rheometer is incapable of exploring the flow phenomena above a value of greater than about 8×10^{-7}/sec., it is necessary to design a new instrument for the continuation of this project.

Results

The records of the observations are obtained as total force on the plunger (in Kg.) and rate of travel of the plunger (mm./minute). These are converted into P and V according to

$$V = \frac{4Q}{\pi R^3} \qquad P = \frac{R\,\Delta p}{2l}$$

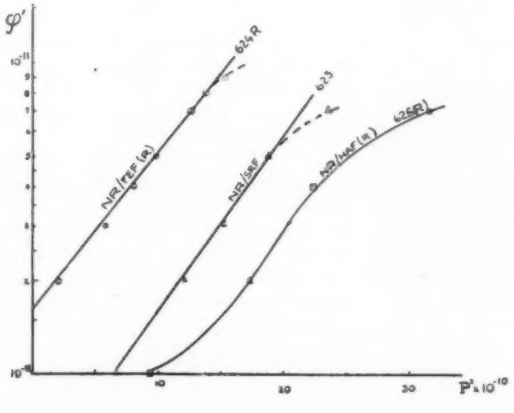


Fig. 7. Semilog plot of Fig. 5. Temp. 50°C.

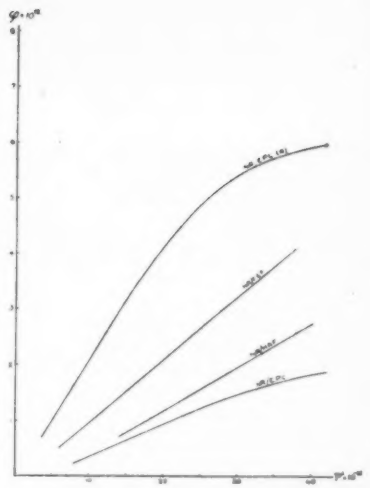


Fig. 6. Temp. 50°C. Apparent fluidity curves. An upper limit is obvious in at least two cases

where no pressure losses are taken into account at the nozzle entry and exit.

These are plotted in Figs. 2, 3 and 4. Fig. 2 shows the plot for the rubber/black batches ' as mixed,' Fig. 3 compares SRF with FEF (R) at plasticities of 136 and 118, respectively, while Fig. 4 compares FEF, HAF (R) and EPC (R) at plasticities of 177, 193 and 184.

It is obvious from Fig. 2 and Fig. 3 that the higher the plasticity number the lower the flow rate obtained, as would be expected. However, when comparing the curve for EPC with that for HAF, doubt is raised whether the two blacks confer the same *character* of flow. A study of Fig. 4 raises similar doubts.

From these curves, φ^1 was calculated for a number of points and the results were plotted. The shapes of the plots fall into two groups. FEF, HAF and EPC appear to show structure before reworking, and this structure persists in EPC even after milling. FEF and HAF lose this structure on milling for extended periods, and SRF has no

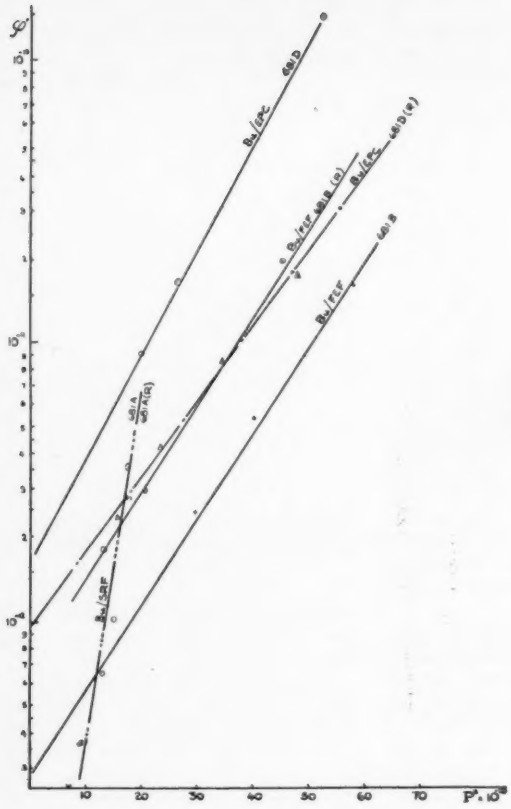


Fig. 8. Semilog plot of Butyl 101. Apparent fluidity curves at 95°C.

structure even in the ' as-mixed ' condition, the rate of loss of viscosity of highly milled FEF being much greater than that of HAF (see Figs. 5 and 6).

It is important to note that the original structure is not recovered on resting, at least for some two weeks.

Replotting Fig. 5 on semi-logarithmic scale (Fig. 7), we note that over a considerable range, and for 624 R and 623 at least, the fluidity may be written as

$$\varphi^1 = \varphi_0 e^{\lambda P^2}$$

where λ may be termed an ' index of lability ' of the breakdown of structure. However, such an expression for fluidity does not appear possible, since it would tend to indicate that the viscosity tends to zero at a sufficiently high shear stress, a fairly impossible state of affairs. Examination shows that in these two cases the extreme points both lie to the right of the line, indicating the onset of a finite viscosity, and this is more clearly seen in the semilogarithmic plot of 625 R.

The butyl stocks, designed to give lower rates of shear at the high stress, do not show the same structure as the ' as-mixed ' stocks, and they are all labile insofar as, even at the higher ranges, they do not show any tendency to reach a constant value of φ^1 (see Fig. 8). The general character of flow does not change with additional milling, nor for that matter do the constants to any marked extent. Thus the curves for 681A and 681AR are, to all intents, identical; 681B and 681BR have parallel semi-logarithmic plots, the fluidity rising (viscosity falling) with increased milling. Surprisingly, remilling the EPC stock 681D shows a *decrease* of fluidity φ^1, as well as a slight change of slope.

It is difficult to assess the reason for the lower value of φ^1 for 681A than for 681B, but the extreme steepness of the plot will undoubtedly magnify error in φ_0 considerably as a result of small errors in temperature and pressure readings.

The following values of the constants can be calculated from the plots, but they must be considered rather inaccurate, and only in the range of the straight-line plot.

Black	*Elastomer*	*Condition (a)*	ϕ_0 (1/*poise*)	λ (*cm.*⁴/*dyne*²)
SRF	NR	M, 50°C.	4.5×10^{-5}	$5{,}580 \times 10^{-15}$
FEF	,,	M	— (b)	— (b)
FEF	,,	R	170×10^{-5}	$5{,}020 \times 10^{-15}$
HAF	,,	M	— (b)	— (b)
HAF	,,	R	— (c)	— (c)
EPC	,,	M	— (b)	— (b)
EPC	,,	R	— (b)	— (b)
SRF	Butyl 101	M, 95°C.	0.04×10^{-12}	130×10^{-15}
SRF	,, ,,	R	0.04×10^{-12}	130×10^{-15}
FEF	,, ,,	M	27×10^{-12}	31×10^{-15}
FEF	,, ,,	R	67×10^{-12}	31×10^{-15}
EPC	,, ,,	M	158×10^{-12}	37×10^{-15}
EPC	,, ,,	R	91×10^{-12}	27×10^{-15}

(a) M = as mixed; R = remilled.
(b) Stocks are stable, *i.e.* show structural viscosity.
(c) Plot too far from straight line to allow estimates.

Conclusion

From a practical point of view, the observations and deductions made would appear to demonstrate that NR stock containing oil furnace ' structure ' blacks must be thoroughly milled in order to exploit their labile tendency and so obtain faster extrusion rates. Channel black stocks would appear to benefit only slightly.

In butyl stocks, excessive milling makes little difference to the oil furnace blacks studied, but there is an indication that the viscosity of channel black mixes increases with milling.

Rheologically, the black/rubber system is seen to be a highly complicated one and it would merit additional study with more accurate instruments.

This work, which is published by kind permission of the Board of the Rubber Research Association Ltd., Haifa, was made possible by a grant from Godfrey L. Cabot Inc., Boston, Mass. The author is grateful to Dr. E. M. Dannenberg of this Firm and to Prof. M. Reiner of the Technion-Hebrew Institute of Technology, Haifa, for their advice.

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[3]Tensometer Ltd., Croydon, Surrey.

IRI Merseyside Section

The second dinner dance of the IRI Merseyside Section will be held on Saturday March 7 at 6.30 for 7.0 at Reeces Restaurant, Parker Street, Liverpool.

Tickets will be 25s. each and in view of the enormous success of last year's event early application for tickets is essential. Tickets may be obtained from the hon. secretary of the Section, Mr F. W. Ball, Dunlop Rubber Company Ltd., Speke Liverpool, 24.

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CORRESPONDENCE

LATEX FOAM RUBBER

To the Editor

Sir,—As a member of the staff of the longest established foam rubber manufacturers in this area, I feel that I must comment on the article by your Malayan correspondent in your issue dated December 13 1958.

The price of foam rubber both for internal distribution and export has gradually and continuously decreased over a number of years. Your correspondent compares the export figures for February with those of August 1958 and suggests the reason is the establishment of foam factories in neighbouring territories and a recent (imaginary) increase in the price of latex foam. The large export figure in February is certainly a regular feature for this company and is due to two well-known factors.

In fact, Malaya and Singapore are possibly amongst the cheapest sources of latex foam rubber in the world and in consequence the imports of foam rubber are now virtually stopped even in Singapore where there is no tariff wall.

Yours faithfully,
L. L. BEST.
Waterhouse Rubber Products Ltd.,
Singapore. January 20 1959.

ASBESTOS DEMONSTRATION

Demonstrations of salient characteristic of amosite asbestos, its 'flocculence' (bulkiness when fiberized) will be given on the stand of The Cape Asbestos Company Ltd., manufacturers of 'Caposite' amosite asbestos moulded insulation materials, at the Engineering, Marine and Welding Exhibition (Olympia, London), April 16 to 30. A new colour sound film showing how crude asbestos is extracted from rock inside one of the Cape Asbestos mines in South Africa will be shown publicly for the first time on the stand during the exhibition. Also featured will be the company's product 'Rocksil' rock wool insulation.

A large extension to its glass fibre industry during 1960 is being planned by China. Increases in carbon black production are also envisaged.

Practical Rubber Technology

COURSE AT NEWTON HEATH

A SHORT residential course in practical rubber technology will be held from April 1 to 11 at the Newton Heath Technical College, Newton Heath, Manchester 10 (Collyhurst 4158).

The course is essentially practical in nature. Instruction will be provided in the handling of natural and synthetic rubber, including mastication, mixing, calendering, extruding, spreading, moulding and vulcanization; tension and compression stress-strain tests, tear, abrasion and flexing resistance, resilience, hysteresis and low temperature testing. Practice in latex compounding and fabrication will also be provided for those desiring it. Involving 70 hours of practical technology the course will include a number of short lectures on topics of general importance.

The total cost of the course including accommodation and tuition will be £13 13s. Cheques should be made payable to the Registrar, Newton Heath Technical College. Further particulars may be obtained on application to the Applied Science Department of the College.

The Rohm and Haas Chemical concern of Canada has purchased 210 acres in the Morrisburg Ontario area for a plant that may cost $2m. The company manufactures a number of chemical products including resins.

US Tyre Prices Raised

ORIGINAL EQUIPMENT INCREASE

PRICES of original equipment tyres produced by major US rubber tyre companies were raised by one to 2½% effective as of January 1 according to informed trade sources. This is the first increase of any consequence since October 1 1957. Tyres that come with new models of cars, trucks, buses and other vehicles are termed 'original equipment.' Pricing of these tyres is a subject of direct negotiation between rubber companies and vehicle manufacturers. For that reason, changes are not publicly announced and with most car manufacturers prices are subject to review quarterly or even more often.

The price increases, it is understood, vary somewhat by types of tyres, individual suppliers and individual customers. They compare with an average increase of 2% reported in October 1957. The latest boost was prompted by higher labour and material costs.

The original equipment price boost is likely to be a forerunner of retail tyre price increases for consumers later this year, it is believed. In addition to extra costs incurred since a 3% retail boost last July, most rubber companies are facing another increase in their wage costs this summer. Leading companies in the industry soon will go into extensive bargaining sessions with the AFL-CIO United Rubber Workers' Union. These sessions will likely produce increased pension, health, lay-off and other fringe benefit costs and culminate in a general wage boost early this summer.

Retail tyre prices have climbed nearly 20% in the past five or six years.

Sales Rise Predicted

The tyre industry will sell approximately 18% more tyres during the first quarter of 1959 than it did during the same part of 1958. This was the prediction of Mr E. F. Tomlinson, president of B. F. Goodrich Tire Company, a division of the B. F. Goodrich Company, addressing a company sales meeting recently. Passenger car tyre sales are expected to reach 23,325,000 units this quarter, compared with 19,717,000 in the first three months of last year.

Reasons for the expected increase were the large number of 1955, 1956 and 1957 cars on the road which would now need replacement tyres; the steady increase in the number of multi-car families (more than 13 million today); and the increase in long - distance, sustained-high-speed turnpike driving which is making more and more car owners tyre safety conscious. He estimated that total tyre sales, also, for the first quarter will run about 18% above those of the first three months of last year. Unit sales of 28.5 million passenger, truck, bus, farm and aviation tyres are predicted for the first quarter of 1959, compared with 24,139,000 last year.

High Temperature Vulcanization

RESEARCH AND APPLICATION

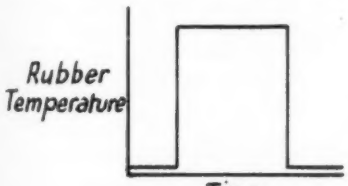
IT is not always easy to assess the impact of fundamental research on applied science and technology until some considerable time has elapsed and many results have been obtained. The work reported by Dr G. Bielstein (British Insulated Callender's Cables Ltd.) in his lecture to the IRI London Section on January 13 proved exceptional in that the results may be applied more or less directly to the improvement of continuous vulcanization techniques. Entitled 'Some Aspects of High Temperature Vulcanization,' the lecture opened with a brief historical survey of progress in vulcanization methods. Nowadays, we commonly vulcanize rubber at temperatures in the range of 140° to 165°C. During the vulcanization process, two principal reactions are recognized:

1. Cross-linking.
2. Reversion or degradation of the cross-linked structure.

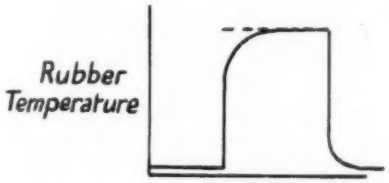
On raising the vulcanization temperature to 200°C., not only do we observe differences associated with the reduction of the time scale but there may also be changes in the rate-determining reactions, which invalidate any method of determining rates of vulcanization by extrapolation from data obtained at 'normal' curing temperatures. In an ideal experiment, the rubber is suddenly raised to a uniform curing temperature at the commencement of cure and suddenly chilled to freeze the reaction at the termination of cure. The latter condition may be obtained approximately but for real systems, one would expect an asymptotic temperature rise at the commencement of cure with consequent uncertainty in the determination of cure times which are of the order of seconds at these high temperatures.

By application of Newton's Rule to the curved portion, it was shown that negligible reaction occurred during the early part of the heating up period followed by a sudden development of full curing speed.

In a series of experiments, rubber filaments were cured with saturated steam at temperatures up to 200°C., the state of cure being characterized by determination of the modulus at 100% elongation (using a modulus balance). Interesting results were obtained with a polychloroprene compounded with zinc oxide (5 phr), magnesia (4 phr) and an aldehyde-amine accelerator (2 phr). It was first shown that there was no reversion on overcure at temperatures from 140° up to 200°C. The relation between modulus and time of cure at each temperature was found to be first order by the usual method of plotting, and the first order rate constants were obtained. The logarithms of these were plotted against reciprocal of absolute temperature in the usual form of Arrhenius plot, and it was shown that a change of activation energy occurred from 10 kilocalories per mole below 170°C. to 30 kilocalories per mole above this temperature.



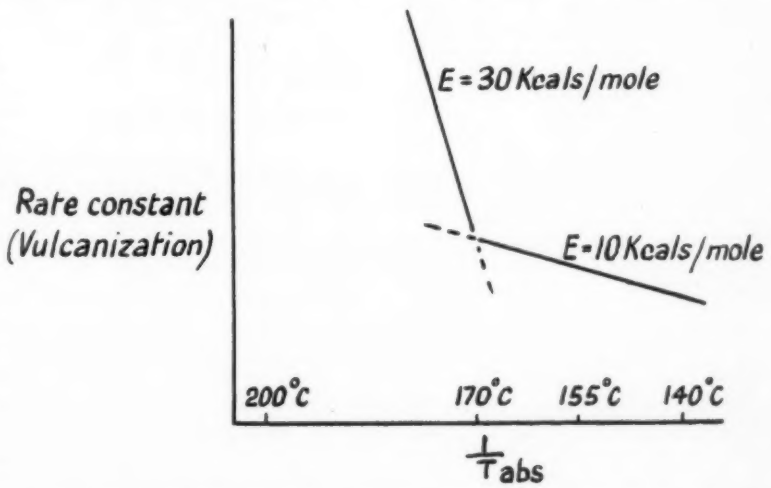
IDEAL EXPERIMENT



REAL EXPERIMENT

Modern theories of vulcanization associate the action of accelerators with a lowering of the activation energy. Some confirmation of this was obtained by showing that the rate constant for unaccelerated compound at 197.5°C. lay on the same Arrhenius line as for the accelerated polychloroprene. It was pointed out later in the discussion that this critical temperature of 170°C. might be associated with the onset of rapid decomposition of the aldehyde-amine accelerator and Dr Bielstein agreed that a subsidiary experiment should be carried out to investigate the behaviour of the accelerator alone at such elevated temperatures.

In sulphur cured rubbers, reversion plays a substantial part in the overall cure. This was shown by investigating an ACS 1 type compound based on acetone extracted SP crepe. A further study of a 'sulphurless' (TETD) cure, which shows negligible reversion at normal curing temperatures, demonstrated that reversion occurs at higher temperatures. Detailed differences from the ACS1 curve of modulus against time of cure, require further investigation and may provide evidence for a pre-cross-linking reaction in thiuram disulphide cured compounds. Finally, reference was made to studies using non-sulphur systems containing firstly, dibenzoyl



Continued on page 164

Rubber and Plastics in South Africa

NEWS OF FIRMS AND PRODUCTS

RUBBER batons, made in South Africa, will gradually replace wooden batons in the South African Police. An order for 1,000 rubber batons, to a specification which has been approved by the South African Bureau of Standards, was placed recently. As wooden batons become unserviceable, the rubber batons will be issued. A police officer said the rubber baton did not cause an open wound after a blow, although it bruised. 'We first approved rubber batons 15 years ago. We examined rubber batons from various countries and designed our own, based on them. The new batons will be issued to both European and non-European policemen.'

Surgeons' Gloves

Surgeons' gloves were the subject of an urgent application in the Witwatersrand Supreme Court, Johannesburg. On December 23, the judge issued a rule nisi which operates as a temporary interdict against the distribution of a pamphlet called 'Modern methods of sterilizing surgeons' gloves.' The applicant, Vulco Chemical Co. Ltd., Industria West, Johannesburg, said it intended to bring an action against the three respondents, Veedip, Ltd., Slough, England, Mr S. D. Sutton, a director and general manager of Veedip, and Mr F. C. Marcus, of Cape Town. In the action, Vulco intended to ask for an interdict against the publication of the pamphlet, which, it was alleged, contained misrepresentations. The applicant company said in its petition that in about May 1957 it began making surgeons' gloves out of rubber latex. It was the sole manufacturer of this type in South Africa. Until then gloves made of a rubber solution called gum-dipped or solution gloves had been used almost exclusively in the Union. Since Vulco began making rubber latex gloves there had been a large demand for them and a corresponding drop in turnover for manufacturers and importers of the other type.

AECI Expansion

The current expansion programme of African Explosives and Chemical Industries Ltd., provides for the production at Modderfontein, near Johannesburg, of Methanol, formaldehyde and urea-formaldehyde resins, while at the same time the company will increase materially its output of chlorine in the Umbogintwini factory, near Durban; there is an increasing demand in Southern Africa for chlorine products, particularly for polyvinyl chloride. Plastics are playing an increasingly important part in the output of the company, and with the big demand south of the Zambesi River for polythene, the company is planning to produce this plastic in all the grades and densities in general industrial use. This will be the first time that polythene plastics materials have been produced in South Africa.

Glass Fibre

Glass fibre sheets and hulls for small boats are among the lines produced in Southern Rhodesia by a Gwelo factory that has recently moved there from Bulawayo, the better to cope with the very strong demand in the Federation for these items.

Dunlop in Rhodesia

Steady development is taking place in the Rhodesian plant, at Bulawayo, of the Dunlop organization. This factory is now turning out token supplies of motor-car tyres, but it is expected that next year it will be in full production, with a staff of over 500 workers.

Finished Plastics Sales

It is reported in South Africa that during 1958 sales of plastic goods and toys were below the level achieved in the previous year, but are considered to be satisfactory in view of prevailing trends. There was a good sale of plastic household goods and novelties over the Christmas season and this improved the general average for the year. During the current year there is expected to be a strong demand for plastics and glass fibre manufactures from the building trade.

High Temperature Vulcanization

Continued from page 163

p-quinone dioxime plus red lead and, secondly, dicumyl peroxide plus hydrated lime.

The discussion was opened by the chairman, Mr C Avons and ranged far into the realm of speculation where cure temperatures exceeded 200°C. and natural rubber was cured in a matter of seconds in the absence of organic accelerators.

Power Convention

ELECTRICITY AND LIVING STANDARDS

'ELECTRICITY and Its Contribution to the Standard of Living' is to be the theme of the 11th British Electrical Power Convention to be held in Torquay from June 1 to 5. There will be an Electrical Exhibition associated with the Convention. Among the papers to be presented is one by Mr O. W. Humphreys, research director, General Electric Co. Ltd., with demonstrations, on 'The Development of Light Sources.' Details from: British Electrical Development Association, 2 Savoy Hill, London, W.C.2.

Chemical Engineering Exhibition

The Achema 1961, 13th Exhibition Congress of Chemical Engineering organized by the Deutsche Gesellschaft fur Chemisches Apparatewesen, will be held in Frankfurt from June 9–17 1961.

Plastic Wall Covering

Non-flammable Cobex sheet manufactured by BX Plastics Ltd. is being used to cover unprotected cement,

plaster and tiled corners in hospitals, hotels and schools where for a long time damage to such corners has been the cause of considerable expense and constant repair. A hospital in south-east London is now using Cobex to protect the plaster corners of the corridors and wards and the tiled corners in the kitchens, where, hitherto, considerable damage has been caused by trolleys, etc.

Splash guards, made of Cobex, to protect walls behind sinks, have also been installed in the hospital. The moulding work for the installations was carried out by Splintex Ltd., London.

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Institution of the Rubber Industry

REPORT ON THE 1958 EXAMINATIONS

THE following comments were made by the Chairman of the Examinations and Qualifications Board of the IRI with regard to the Associateship examination, 1958.

This year's results showed a definite improvement in the quality of answers to the papers in Rubber Science I (Chemistry) and Rubber Science II (Physics), and in the practical work; the level in Rubber Technology I and II was only fair; some of the essays were good, but the translations from French and German were generally of a poor standard. In the Chemistry paper candidates tended to avoid the mathematical questions, but this did not show itself so markedly in the Physics paper. Nevertheless there were frequent arithmetical mistakes.

A reluctance to be precise and an indifference to the true meaning of words were common.

Candidates still introduce irrelevant matter and penalize themselves by not attempting the required number of questions.

RUBBER SCIENCE I

Chemistry

The questions were as follows:

Q. 1. *Outline one method of bulk production for each of* three *only of the following ingredients for use in compounding rubber: (a) china clay, (b) lithopone, (c) magnesium oxide, (d) whiting, (e) silica, (f) zinc oxide, (g) carbon black.*

State briefly the routine tests you would make on deliveries of two *of the ingredients you have chosen, to ensure their suitability for use in rubber.*

Q. 2. *Derive an expression relating the molecular weight of a solute in solution to the lowering of the vapour pressure of the solvent.*

The vapour pressure of diethyl ether (molecular weight 74*) is lowered from* 40.21 *cm. to* 37.91 *cm. by the addition of* 5.24 *gm. of isoprene to* 100 *gm. of ether. Calculate from these data the molecular weight of isoprene.*

Q. 3. *Outline analytical methods suitable for determining* two *of the following: (i) total nitrogen in an acrylonitrile copolymer, (ii) total chlorine in polyvinyl chloride, (iii) total zinc in vulcanized natural rubber, (iv) sulphur present as metallic sulphide in vulcanized natural rubber.*

Q. 4. *When dilute aqueous ammonia is added to a solution of zinc sulphate in water a precipitate forms which redissolves in an excess of the reagent. Explain this.*

Give an account of the chemistry of the Kaysam process and explain the role of zinc oxide in the gelling of natural rubber latex at elevated temperatures (80-90°*C.*).

Q. 5. *Explain the principles underlying the buffer action of a solution containing a weak acid and its sodium salt.*

The dissociation constant of a particular mono-basic acid is 10^{-5}.

Calculate the pH (to the nearest 0.1 *unit) of: (i) an aqueous solution of the acid, of strength* 1*M*, *(ii) an aqueous solution of the acid, of strength* 0.1*M*, *(iii) a mixture of equal volumes of* 0.1*M acid and* 0.05*N sodium hydroxide.*

Q. 6. *Outline the chemistry of the formation of condensation polymers using organic* isocyanates.

Describe briefly one process for the preparation of such polymers.

Q. 7. *In the production of elastomers by emulsion polymerization, how do the various ingredients used, other than the monomers, affect the properties of the product?*

For what technical reasons have the commercially available co-polymers of butadiene with other monomers been generally preferred to polybutadiene?

Q. 8. *Write an account of the chemistry of those thiuram sulphides which are used in the vulcanization of rubber. Why is another organic accelerator often used with a thiuram disulphide in the same rubber compound?*

Q. 9. *Discuss broadly how the relationship between the molecular structure and physical properties determines whether a polymer behaves as a rubber, a fibre or a resin.*

Illustrate your answer by referring to specific rubbers, fibres, and resins used in the rubber industry.

Q. 10. *What are the main constituents, other than rubber and water, of the commercial grade of natural rubber latex known as '* 60% *centrifuge concentrate'? In what respects do the constituents of such latex differ from those of fresh latex before it is preserved and concentrated?*

Explain how you would prepare from commercial natural rubber latex a few grams of rubber hydrocarbon containing less than 0.2% *of impurity.*

EXAMINERS' REPORT

In their report on these questions, the examiners said that a real improvement was apparent in the standard achieved in this year's chemistry examination. A larger proportion of candidates than usual showed a sound grasp of the subject matter, and several submitted papers of high quality.

The most popular questions were those relating to compounding ingredients (Q. 1) and emulsion polymerization (Q. 7). Both were competently answered, which was not entirely unexpected in Q. 1 in view of the large choice given, but few candidates were able to suggest why co-polymers made from butadiene had hitherto proved to be of greater industrial importance than polybutadiene.

As usual, questions with an arithmetical content were unpopular. Only three out of 51 candidates dealt adequately with the 'text-book' question on vapour pressure lowering and molecular weight (Q. 2); and although several good accounts of buffer action were submitted (Q. 5), too many candidates seemed to be intimidated by the simple numerical rider.

The response to the question on analytical determinations (Q. 3) was disappointing; only about one candidate in six tackled this question with any degree of confidence or accuracy. Many candidates thought that the chloride in polyvinyl chloride could be removed by gentle heating with aqueous alkali.

The question on the zinc-ammonia complexes (Q. 4) proved a popular one and produced some good answers. Those candidates attempting it appeared to be generally familiar with the 'Kaysam' process although their explanations were not always entirely accurate.

The answers received to the question on the chemistry of organic *iso*cyanate condensation polymers (Q. 6) were of only average quality, being often too long and insufficiently explicit.

Those who answered the question on thiurams (Q. 8) tended to discuss their technological properties rather than their chemical reactions; otherwise this question was fairly well answered.

Least popular of all was the question on the relationship between molecular structure and physical properties (Q. 9). Very few candidates gave satisfactory accounts of the essential molecular characteristics of rubbers, fibres and resins. The Examiners feel that candidates' answers to this question were unsatisfactory in view of the basic importance of high-polymer chemistry in present-day rubber technology.

The question of the constituents of natural rubber latex (Q. 10) received answers of widely different standards. Only a few candidates gave adequate methods for preparing a sample of pure rubber hydrocarbon.

F. A. JONES.
M. W. PHILPOTT.

RUBBER SCIENCE II

Physics

The general standard of answers was vastly improved over that of recent years. There were several very good candidates. All candidates obviously considered and studied the questions before attempting an answer. Only three candidates failed to tackle five questions and each of them failed the paper; two of them were close to attaining a pass mark from their answers to four questions. A mathematical question

was included and was very well done. The Examiners were pleased to note that the mathematical riders to questions were attempted with less reluctance but too many simple arithmetical mistakes were made in dealing with the riders. When candidates were asked to deal with symbols (Qs. 1 and 6) they were unable to do so and clearly students require to become more familiar with this aspect of physics.

Q. 1. *Describe the Mooney shearing disk viscometer with particular reference to the mechanical arrangement connecting the rubber under test with the indicating dial.*

Give an account of the method used to calibrate the instrument, and work out the relation between the mass M *(gm.) of each calibrating weight and the dial reading* D *(inches/1,000) during calibration where* r *(cm.) is the effective radius of the calibrating rotor,* R *(cm.) is the effective radius of the drive sprocket and* S *(dyne/cm.) is the stiffness of the spring.*

Twenty-six candidates answered this question. The description of the Mooney viscometer was reasonably well done but the answers to the second half of this question, involving use of symbols, were a great disappointment to the Examiners.

Q. 2. *Give a full description of the operations involved in the tensile strength testing of a rubber based on (a) dumb-bell test pieces,* and *(b) ring test pieces commencing in each case with the unvulcanized compound. Compare the two methods from the viewpoint of output of results and operator fatigue when used for large-scale routine testing. Would you expect to find a systematic difference between results given by the two methods? If so, state the reasons for the difference.*

There were 44 answers. The Examiners gained the impression that candidates were more familiar with dumb-bell testing than ring testing. Some candidates answered the question without comparing the two methods, although it was clear that this was an important part of the question.

Q. 3. *State briefly the principles of four methods which may be used to measure the thickness of a thermoplastic sheet during calendering. Describe fully one modern method of gauging (which may be one of the above) which is least likely to affect the thickness of a very soft material in the vicinity of the measuring device. Give an outline of the application of this method to automatic gauge control.*

(8 answers.) Some answers were inadequate in that they did not state the principles of four different methods of measuring the thickness of thermoplastic sheet.

Q. 4. *Describe an apparatus for the investigation of heat build-up in a rubber specimen subjected to rapid cyclic stress or strain. Explain why the ranking of different materials in terms of heat build-up may vary according to (a) the mechanical conditions of test, (b) the temperature of test.*

(11 answers.) The answers to this question were good.

Q. 5. *Give your views and suggestions on* one *of the following subjects: (a) designing experiments to investigate inter-laboratory errors, (b) physical factors of importance in testing cellular products, (c) difficulties of interpreting results from fatigue tests on rubber, (d) relation of low temperature tests to service performance.*

(19 answers.) The standard of answers varied greatly. Some candidates had little conception of the planning of experiments and some merely reproduced a list of definitions of statistical terms. Answers on testing cellular products were adequate. The section on fatigue tests was not attempted. The answers on low temperature tests were extremely poor.

Q. 6. *Deduce from first principles the acceleration towards the centre of a particle moving in a circle of radius* r *with constant speed* V.

A hollow cone with the apex pointing downwards is rotating with angular velocity ω *about its axis, which is vertical. The sides of the cone are inclined at an angle* α *to the vertical.*

A small object on the inside surface of the cone is stationary with respect to that surface. Show that the distance d *of the object from the apex must obey the relation*

$$\frac{\cot\alpha + \mu}{\sin\alpha - \mu\cos\alpha}\cdot\frac{g}{w^2} > d > \frac{\cot\alpha - \mu}{\sin\alpha + \mu\cos\alpha}\cdot\frac{g}{w^2}$$

where μ *is the coefficient of friction between object and cone and* g *is the acceleration due to gravity.*

(3 answers.) None of the candidates was able to deal with this question properly.

Q. 7. (*a*) *Solve for x and y*

$$3x - 2y = 4$$
$$5x + 7y = 6$$

(*b*) *If* $A = \frac{200}{B} - 16$ find $\frac{dA}{dB}$ *at* $B = -2$

(*c*) *If* $X = 300 + 72y - 16y^2$ find $\frac{dx}{dy}$ *at* $y = 2$

(*d*) *If* $X = 300 - 18y + 32y^2 - y^3$ find $\frac{d^2x}{dy^2}$

(*e*) $\int (x^3 + 1)\,3x^2\,dx$

(*f*) $\int \frac{3x^2}{x^3 + 1}\,dx$

(*g*) $\int (\cos^2 x + 2\sin x\cos x - \sin^2 x)\,dx$

(*h*) *Evaluate* $\int_{-1}^{+1} (X^4 + X^2 + 1)\,dx$

(48 answers.) Most candidates did extremely well.

Q. 8. *Discuss the physical principles involved in methods of measuring resilience of rubbers. Describe one method and state what corrections need to be applied to the results.*

If a steel ball is dropped from a height of 1 *metre on to a block of rubber and rebounds* 49 *cm. what is the coefficient of restitution between the ball and the block?*

(31 answers.) There were a few very good answers but too many candidates were hazy about what constitutes a physical principle and there were many simple mistakes in dealing with the rider.

Q. 9. *Discuss the principle of conservation of energy. Define the terms efficiency and power as applied to machines. One of the simplest mechanical means of measuring the power of a driven shaft or pulley is called the 'Prony brake.' Describe a simple form of 'Prony brake'; if the power* P_0 *in watts dissipated as heat in a brake drum and lining is*

$$P_0 = \frac{(F_1 - F_2)g\,2\pi\,r\,n}{10^7}\ \text{watts}$$

how would the other terms in the equation be defined?

(2 answers.) The two candidates gave very good answers.

Q. 10. *What physical factors are important in thermal insulation? As the thermal conductivity of air is far less than that of many materials used for insulation, why are these materials used? Give your opinions on the practice of using cellular materials for insulation.*

Calculate the total number of calories per second of heat conducted radially outward from an aluminium pipe 10 *metres long with an internal surface temperature of* 200°*C. and an external steady temperature of* 30°*C., the inside diameter being* 8 *cm. and the outside* 10 *cm. (thermal conductivity of aluminium* k = 0.48 *c.g.s. units).*

(44 answers.) Several candidates failed to marshall their ideas on what physical factors were important and many made simple errors in dealing with the rider. A few candidates, however, gave very good complete answers.

Q. 11. *Discuss the features which determine the performance of a moving coil galvanometer, with special reference to the measurement of potential and charge.*

If energy costs 5*d. per kilowatt-hour how much does it cost to operate an electric motor that takes* 6 *amp. at* 110 *volts, assuming the motor runs for* 8 *hours?*

(16 answers.) Many candidates displayed a very poor knowledge of a basic physical instrument. The simple rider was fairly well done.

J. M. BUIST.
W. P. FLETCHER.

Continued on page 175

VIEWS and REVIEWS

Testing of Rubber Rings

IN *ASTM Bulletin* No. 233 (October 1958, p. 39) there is a paper by F. L. Roth and R. D. Stiehler [(US) *National Bureau of Standards*] entitled 'Tension Testing of Rubber Rings.'

It appears that in the development of a method for tension testing of O-Rings, sub-committee X of ASTM Committee D-11 on Rubber-like Materials found that the type of roller grip varied in the several methods for tension testing of rubber rings *(examples given in present paper)*.

Survey of Grips Used in Past

The situation adumbrated above led to a comprehensive survey of the grips employed in various rubber laboratories and their method of operation. Among 240 laboratories which responded to a questionnaire, 45 make tests on ring specimens. In the latter the following grips were employed:—

Grips	Laboratories
Single roller, power-rotated	22
Single roller, free to rotate	12
Double roller	4
Half cylinder	3
Hook	4

As a result of the above data the NBS agreed to investigate the effect of the single and double roller grips on the stress and elongation at failure of O-rings and other ring specimens.

Results of NBS Investigation

As a result of the National Bureau of Standards work it was found that the type of roller grip had no significant influence on the properties mentioned when castor oil was used between the specimen and the roller. It is recommended that lubrication be required in standard methods of test for ring specimens.

(Note: The following grips were used in the NBS study:—

1. Single-roller ½in. in diameter, mounted on ball bearings.
   (a) Lower roller rotated once per 6in. travel, and
   (b) Neither roller power-driven.
2. Double-roller, $\frac{5}{16}$in. in diameter, mounted on ball bearings.

Fibreglass Reinforced Laminates

Amongst the numerous interesting items in the above issue of *ASTM Bulletin*, in addition to the foregoing, there is one (p. 40) entitled 'Tensile and Compressive Properties of Fibreglass Reinforced Laminates' by Richard E. Chambers and Frederick J. McGarry (both of MIT).

The authors have developed a new technique using integrally bonded foil resistance strain gages which permits interior distortion measurements through the thickness of fibreglass-plastic laminates. This makes possible a detailed examination of orthotropic theory and an evaluation of the effects of certain parameter variations to better understand laminate behaviour.

Detailed studies of tensile, compressive, and flexural actions establish a consistent correlation between such actions and indicate that partial failure of the resin during tensile stressing takes place, both in uniaxial and flexural tests. This failure, indicated by the knee in the stress-strain curve, has been further verified by moisture absorption under prolonged water immersion of laminate specimens before and after tensile stressing.

Practical Implications

A few words on the practical implications of this interesting research may be helpful. The authors say:—

1. In the tensile behaviour of fibreglass-resin laminates, partial internal failures of the structure take place at stress levels low compared to the ultimate strength of the material and progress as the stress level under cyclic loading is increased.
2. Such failures do not appear to occur under compressive stressing.
3. The flexural behaviour of fibreglass-resin laminates strongly reflects their tensile limitation and appears to be controlled by it.
4. At higher stress levels, the stress and strain distributions in flexural elements depart rather strongly from those classically predicted, and hence the evaluations of the flexural properties are in error, using the conventional simple formulas cited in most testing procedures.

Tufted Carpets

It may be remembered that some time ago (these pages, September 29 1956) I had the opportunity of discussing the development of the Tufted Carpet industry on this page. Now, in the *Proceedings of the Journal of Textile Institute* (1958, Vol. 49, 538) there has been published a paper on the 'Physical Properties of Tufted Carpets' by C. H. Sturley and W. T. Westhead (British Nylon Spinners).

Process of Work

In this research tufted carpets made from viscose rayon, wool, nylon 6.6. and viscose/nylon blends were subjected to laboratory tests and to a user trial as stair carpet. Flattening and loss of resilience of the carpets on cyclic loading and in use were considerably less for the 100% wool and 100% nylon than for the 100% viscose rayon carpet.

Blending of nylon with viscose reduced flattening and resulted in greater retention of resilience and a longer wear life. The 100% wool carpet and viscose/nylon carpets containing more than 20% nylon are still in use.

In addition, a preliminary attempt was made to correlate laboratory results with behaviour in use of the carpets.

Conclusions

For comprehensive details of the work those interested should consult the original with its Illustrations and

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **DR SCHIDROWITZ**

Tables, etc. I must content myself with a brief summary.

Handle and Appearance.—The authors did not find any important differences in the handle of the carpets. However, the 100% nylon carpet had a fibrous surface appearance with the tufts not clearly defined. Whilst this might be considered a disadvantage, it was found that by using a singles instead of a two-fold yarn that a surface having a clearer tuft appearance could be obtained. The difference in appearance of the two nylon carpets was most likely due to a difference in behaviour of singles and two-fold yarns on cutting the pile loops during manufacture.

Flattening and Resilience of Carpets.—It was observed that when used on stairs, the 100% viscose rayon tufted carpets bedded down rapidly owing to compression of the pile, and this resulted in a flattened unpleasing appearance. On the other hand, bedding down of the 100% wool and 100% nylon carpets was considerably less than for the 100% viscose carpet. Blending of nylon with viscose resulted in less bedding down than for the 100% viscose.

With regard to resilience of the carpets when new, and after various stages of use, it was found by the authors to be greatest for the 100% wool and 100% nylon, and least for the 100% viscose. Blending of nylon with viscose again increased the resilience.

The effect of washing was to increase thickness and resilience of all the carpets used, but the order of ranking for resilience of the carpets was unaltered.

Indentation by Static Loads. — It was found that recovery of the 100% nylon carpet from steady load was similar to that for the 100% wool carpet and considerably higher than for the 100% viscose/rayon carpet, which was taken to indicate that blending of nylon or wool with viscose should result in less indentation by furniture legs.

With regard to resistance to abrasion and wear the authors say: 'Under the very severe conditions of use to which the carpets were subjected, the traffic over them before they were worn to the backing at edges of stair treads was 49,000, 71,000 and 86,000 people for the 100% viscose/rayon carpet and carpets containing 10 and 20% nylon, respectively. All the other carpets, including the 100% wool, are still in use.'

It was also noted that laboratory tests for resistance to abrasion correlated well with the traffic which the three worn-out carpets had withstood, and that such tests also showed that the 100% nylon carpet was not worn to the backing even after subjecting it to 20 times the number of rubbing cycles at which the 100% viscose carpet had worn out.

Other tests are still proceeding. It seems, however, that the wear of wool will be considerably longer than is predicted by laboratory tests.

In laboratory abrasion tests 'it was found that preferential wear of the viscose component in a 50% nylon/50% viscose tufted carpet resulted in formation of a protective surface consisting entirely of nylon. It has not yet been shown whether this happens in use.'

Notes

'Thoughts on Compounding Materials' is the title of a booklet (31 pp.) issued by Anchor Chemical Co. Ltd. This was the subject of a lecture given by Mr. Carrington to younger members of the Industry at Newton Heath Technical College in March last. I am informed that reprints are available from the Company's (Clayton, Manchester 11) address, on request.

Amongst the Technical and Trade publications of Imperial Chemical Industries Ltd. is a new Subject Index to the Dyestuffs Division (*4th edn.; replacing previous editions*). This volume of 125 pages covers the period January 1945 to December 1957. It includes references to the industries serviced by the Division, and to other departments concerned, including those of Rubber Service and Resin Service. In general, indexing is alphabetical, assisted by serial numbers, a list of abbreviations, etc.

A most useful feature is a section which gives references to scientific and technical publications bearing on the indexed matter.

No. 59 of the *News Bulletin* issued by *Columbian International* surveys the range of American Clays now being imported. These are differentiated by the process of preparation, and those described are: *Air-floated; Spray-dried Clays, Predispersed Clays,* and *Calcined Clays,* respectively. There are also data re *Functions* and *Properties.*

Although those who compile reports may well be 'sports' the final heading in last week's 'Views and Reviews' should, nonetheless, have read 'RRIM Annual Reports' and not, as it was printed, 'RRIM Annual Sports.'

PHILIP SCHIDROWITZ

International Plastics Exhibition

In order to keep abreast of a continuing demand for space in the forthcoming International Plastics Exhibition (Grand and National Halls, Olympia, London, June 17-27), the organizers, *British Plastics,* have extended the machinery section into the Empire Hall. This will increase the total occupied area to over 270,000 square feet.

Now fully international, the exhibition will put on show plastics materials, machinery and finished products from 15 countries, while Britain's own plastics industry, third largest in the world, will be represented by more than 200 firms. Attendance is expected to exceed 90,000, a figure, which included 6,000 overseas visitors, recorded for the previous exhibition in July 1957.

ASTM Standards

The American Society for Testing Materials is now completing its largest 'Book of ASTM Standards.' The 1958 edition will be published in 10 parts with 13,600 pages and 2,450 standards. Part 9 of the book, Plastics, Electrical Insulation, Rubber, Carbon Black, 1,680 pp., 290 standards includes data on, among others: electrical insulating materials; sponge rubber, hard rubber, brake hose, blankets, foam, automotive, synthetic elastomers.

Part 9 is obtainable from the Book Department of RUBBER JOURNAL AND INTERNATIONAL PLASTICS at £5 10s.

Questions Corner—57

(Second Series)

247. Give some details of the properties of viscose rayon.

248. During the process of the manufacture of synthetic fibres they are stretched to orientate the molecules. What is the effect of this on the properties of the fibres?

249. Give brief details of the use of phenol - formaldehyde resins as adhesives.

250. Di-n-hexyl phthalate is used as a plasticizer for cellulosics and vinyl resins. Give some details.

(Answers next week)

Answers to Questions Corner—56

243. Diethyl phthalate $C_6H_4(COOC_2H_5)_2$ is a phthalate ester used as a plasticizer with certain plastics. It is an excellent plasticizer for cellulose acetate because it imparts a good surface and flow properties to extruded products. As with dimethyl phthalate it can be used in equal proportions with that material but tends to evaporate rather rapidly when used in quantities above about 40%.

Diethyl phthalate is also a good plasticizer for nitrocellulose up to about 75%, by weight, of the cellulose. It is used for lacquer formulations and gives tough, extensible films. Although it is not used to any extent in polyvinyl chloride it is a solvent for polyvinyl acetate and polyvinyl acetals, and it may be used with phenolic resins to improve the impact strength, and also with certain vinylidene-chloride-acrylonitrile co-polymers.

Diethyl phthalate is used as a plasticizer with other cellulosics, and it may be used as a plasticizer for coumarone resins and chlorinated rubber. Its properties are as follow: Specific gravity 1.118 to 1.119 at 25°C.; boiling range 294-295°C.; flash point 152°C. molecular weight 222; vapour pressure 0.01mm. Hg./25°C.; viscosity 10 cps. at 25°C.; Sol. in water 0·01% at 20°C. acidity <0.025% (as phthalic acid); evaporation rate 0.0006g./cm.²/hr./100°C.; slightly more water resistant than Dimethyl phthalate; light fast.

* * *

244. Cellulose ethers are produced by reacting cellulose with strong caustic alkali which forms an alkali cellulose. This is then reacted with an organic compound containing a chloride or epoxy group. Ethyl chloride produces ethyl cellulose, and methyl chloride produces methyl cellulose. On the other hand, monochloroacetic acid gives carboxymethyl cellulose. Mixed ethers can also be made, for example, by reacting methyl cellulose with caustic and then with propylene oxide which results in the formation of hydroxypropyl methyl cellulose. A range of ethers can be produced having different percentages of substitution ranging from about 6% to 44%.

Similarly with ethyl cellulose the ethoxyl content is controlled by the ratio of the reactants and, to some extent, the temperature of etherification. An increasing ethoxyl content first reduces the softening point, reaching a minimum at 48-49% ethoxyl, and then increases. Hardness and moisture absorption both decrease with increasing ethoxyl content. The percentage of substitution affects the ability of the ether to dissolve in water, *e.g.* aqueous caustic is necessary to dissolve methyl cellulose ethers in the range 6% to 18% methoxyl, but where the substitution ranges from 27% to 32% methoxy; the products are directly soluble in water.

* * *

245. Polythene can be used for making yarns and fabrics and can also be converted into short staple fibre for spun yarns, or into monofilaments (and multifilaments) in the yarn form. The bulk of present production is of monofilaments. Polythene yarn is melt spun and extruded, and then drawn to orientate the structure, and also to provide the necessary mechanical properties.

The sizes of the monofilament yarns are basically specified by the diameter, measured in thousandths of an inch, although it may later, and usually is, converted into the textile yarn number called a denier. A denier is related to the square of the diameter and is the weight, in grams, of 9,000 metres of yarn. Staple fibre size is determined by measurement of the denier of the individual fibre and length of the staple.

Low density polythene yarns have moderate strength but high elongation. Its thermal properties, with a relatively low melting point, means that fabrics cannot be ironed with ordinary domestic irons. Polythene filaments, and fabrics woven from them, are non-swelling and non-wetting, and therefore provide easy cleaning. Insects and micro-organisms have no effect.

The chemical resistance of polythene is well known and fabrics are used for filters and protective applications provided the service temperature is not over about 70°C. One interesting application of polythene in textiles is that of fusible interlocking fabrics for bonding in the manufacture of semi-stiff collars, cuffs, etc.

* * *

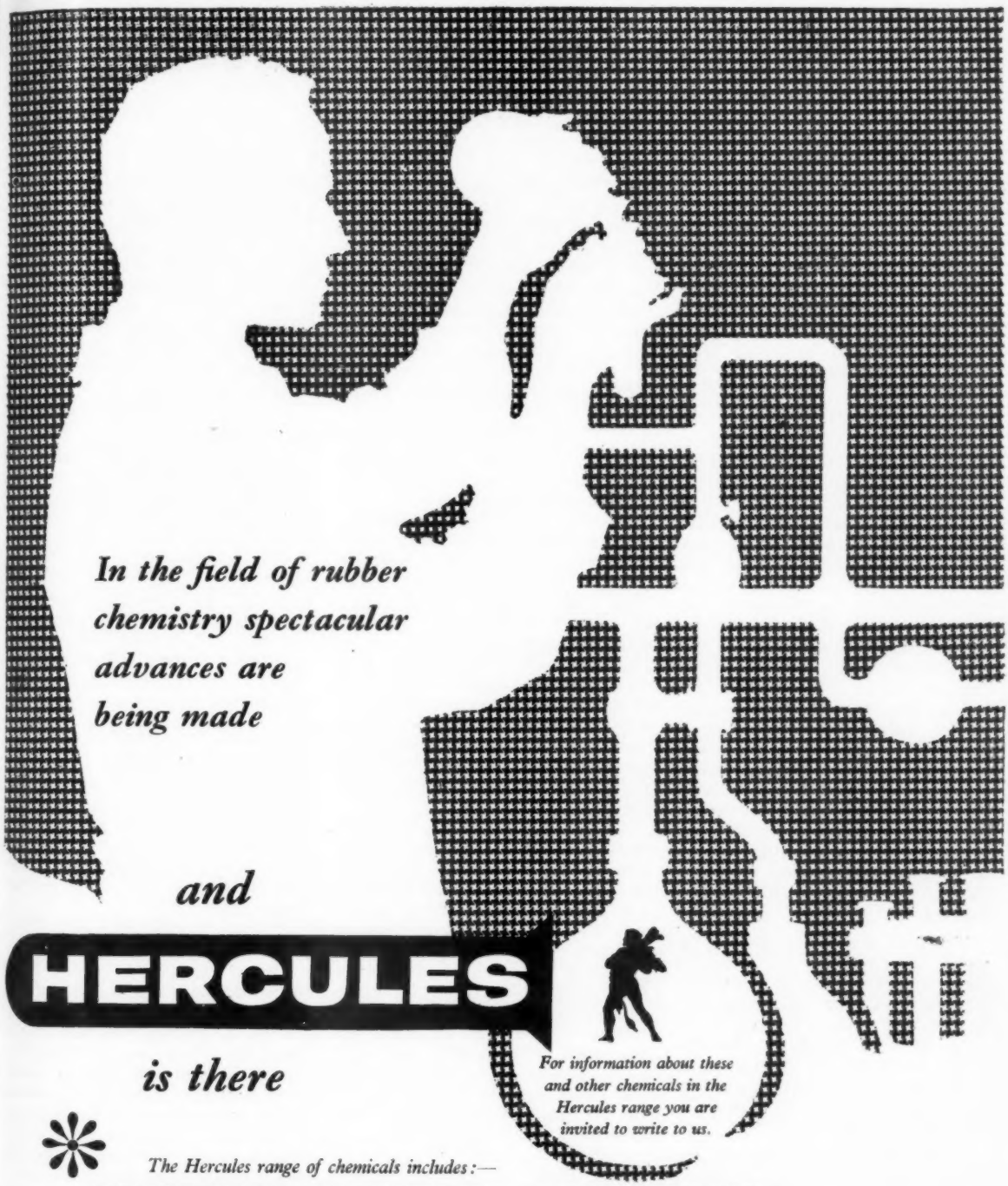
246. Furfuraldehyde can be used as a substitute for formaldehyde in the production of thermosetting resins and has one important advantage in that when reacted with phenol the only water to be removed is that due to the condensation polymerization itself. There is no additional water to be removed as in the case of formalin, which is 37% formaldehyde. Furfuraldehyde is a brown liquid with a boiling point of about 160°C. and a viscosity of about 1.35 cps. at 38°C. It is not readily compatible with water.

Furfural reacts in much the same way as other aldehydes but strong catalysts are required to effect a reaction through the furane ring. In the manufacture of abrasive wheels furfural acts as a plasticizer and wetting the abrasive material. This results in a more effective distribution (USP 1,618,822; 1,576,440; 1,537,454). Furfural can also be used as a hardening agent and modifier for phenol-butyraldehyde resins (USP 1,477,870).

Synthetic resins have also been produced from phenol, formaldehyde and furfural and the presence of the furfural has the effect of giving greater flexibility and penetration characteristics to the varnish (USP 1,737,121; 1,716,665). A heat-reactive resin consisting of equal parts of phenol and furfural, in the presence of sodium carbonate, has been ground to a powder and mixed with powdered rubber. The dry mixture is spread over the metal surface, a layer of rubber added, and the whole vulcanized under pressure (USP 1,931,309).

(More questions next week)

'Plantation rubber?—A Bridge convention in the Far East!'



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MEN and MATTERS

A Review of People and Events

by George A. Greenwood

HOW surprising it is that in these modern days the Fat Boys keep turning up in attempts to make our flesh creep! Why do I say this? Because during recent days some of our friends in the lay Press have deliberately engaged in attempts to make our flesh creep about the position and prospects in certain areas which are responsible for the production of some of the primary necessities, such as rubber.

For example, a correspondent from Singapore, writing in one of the leading provincial newspapers tells the doleful story of the departure — he calls it exodus—of British officials from Government posts in some parts of South-East Asia, giving it a political bias, with references to 'the extension of freedom in the British Commonwealth.' He states that the situation in Singapore has so affected the position of these men, and so left them out in the cold, that they had nothing else to do but clear out, and in the industrial sphere expresses despondency about what is developing since the first 'Malayanization' moves were mooted. In another similar newspaper, a Colombo writer says that a situation which will bring about a dictatorship on the lines of that in Pakistan may develop in Ceylon 'sooner than is expected,' whatever that may be.

The truth is that in both cases the people involved, and the industries they represent, either in South-East Asia or in Ceylon, are being very ill served by these yarn-spinners, and it is at least significant that the despatches of the Fat Boys have, up to the present, had no effect whatever upon the financial and commodity markets in London or in New York.

In the meantime, I note that the Rubber Research Institute of Malaya is advertising in London for a biochemist to extend investigations on the bio-chemistry of Hevea latex, to work in Malaya, and offering yearly emoluments equal to £2,030 increasing by £70 to £3,290, with various attractions including (to an officer not domiciled in Malaya), rent free quarters and an allowance towards children's education, etc. I doubt not in my own mind that it will have no difficulty whatsoever in filling this most attractive appointment.

More Board Changes

Very briefly, we referred last week to the fact that Mr G. K. Hampshire, chairman of I.C.I.'s General Chemicals Division, and Dr J. S. Gourlay, chairman of the Paints Division, have been appointed to the Board of I.C.I., with effect as from Monday next February 2. These are interesting promotions, for a noted Yorkshireman and Scotsman respectively.

Mr George Kenneth Hampshire, born in 1900, was educated at Leeds Grammar School and Magdalen College, Oxford, where he gained First Class Honours in Chemistry. He joined Brunner, Mond—one of the original constituent companies of I.C.I.—in 1933 and ten years later became sales manager of the General Chemicals Group with promotion to a group director in 1937. Two years later he was appointed managing director of the General Chemicals Division, and in 1947 the Division's chairman.

Mr John Scott Gourlay was born in 1905 at Stevenston, Ayrshire. He went to Stevenston School from 1910 to 1919, when he became a laboratory apprentice with Nobels' Explosives Co. Ltd. at Ardeer. Through part-time study and application he gained his B.Sc., an external degree from London University, and was elected an Associate of the Royal Institute of Chemicals in 1930. His association with Nobels' and with I.C.I. has been continuous since 1919, and in the interim 24 years ago he got his Ph.D. from London University.

Nobels' Posts

Dr Gourlay was appointed an assistant development manager of Nobel Chemical Finishes in 1938, and after it became the Paints Division of I.C.I., he became research manager in 1945. Two years later he was appointed to the Paints Division Board as research director. In 1952 he was transferred to I.C.I. Plastics Division as joint managing director, returning to the Paints Division as chairman in 1957.

I hear also that Mr E. T. Ridings, who was managing director of Zama Ltd., the proofing manufacturers of Pendleton, near Salford, has retired after 25 years in office, and I am deeply sorry to know that his retirement is due to illness. As everybody within his circle of friends is aware, he has always been a very hard worker. He was until quite recently chairman of the British Rubber Proofers Association.

At the Pantomime

There was a lovely party for youngsters a Saturday or two ago, when some 20 coaches were necessary to transport approximately 800 children of employees of the London Rubber Company Ltd., from their factories in Chingford to the Finsbury Park Empire where they saw a performance of the pantomime 'Aladdin.' Each child was presented with fruit, biscuits and a packet of 'Ariel' toy balloons and, during the interval, ices and soft drinks. In charge of the children were the Welfare Officer, Mr N. W. Andrews, and some 60 employees acting as stewards, including two of the company's nurses. As in previous years, this party was an outstanding success and with the continued growth of the company each year shows a greater demand for participation in this very popular annual event.

For South Africa

One of the most interesting items of personal news this week is that that old and good friend of many of us, Mr A. S. Bishop, chairman of the Goodyear Tyre and Rubber Co. (Great Britain) Ltd., has just sailed from Southampton on the Winchester Castle for a long tour of South Africa. It will last six to eight weeks, I am told, according to circumstances, and will presumably be mainly a business affair, since Mr Bishop plans meeting friends in the trade, and he will spend some time at the Goodyear organization in Port Elizabeth. But not entirely, I should hope and imagine. I hear that Mrs Bishop is going with her husband.

He is, of course, among many other things, the immediate past president of the Institution of the Rubber Industry, and he had a strenuous but most useful term in that office. Mr Bishop is, incidentally, also a director

of the International Synthetic Rubber Co. Ltd.

On the move, too, has been Mr C. R. Prichard, of I.C.I., who a few days ago flew via BOAC to Karachi.

The Small World

Very recently, under the heading 'The Small World,' I had something to say about the equipment of the famous balloon, and *inter alia*, specified certain details. I am now reminded that all the members of the now historic expedition wore Dunlop Magister yachting shoes! This makes it even more definitely a notable rubber and plastics occasion. This is the sort of information I am always glad to have.

Plastics Exhibition

I hear that at the International Plastics Exhibition (Olympia, London, June 17-27) one organization, the Commercial Plastics Group, has booked the entire end section of the first floor in the Grand Hall. Their display, with a frontage of 160ft., will include PVC film and sheet, polythene, polystyrene and products from these materials. This journal's stand at the Exhibition will be Nos. 410 and 411 on the first floor of the National Hall.

Annual Lecture

I have been asked to point out that the 10th Annual Lecture of the Plastics Institute, to be held on March 12 at the Wellcome Foundation Building, Euston Road, London, is an all-ticket affair. Accommodation is limited and so those planning to attend Mr S. P. Chambers' lecture on 'International Competition in the Chemical Industry,' should make a point of applying early to the PI.

Stereospecific Polymers

A short course on 'Stereospecific polymers and block and graft copolymers' is to be held by the Department of Chemical Technology, Bradford Institute of Technology, on February 27 and 28. The introduction to the course will be given by Dr W. R. Moore, reader in high polymer chemistry, and other lectures will be given by Professor C. E. H. Bawn (Liverpool University), Dr I. Goodman (I.C.I. Fibres Division), Dr C. H. Bamford (Courtaulds), and Dr W. Opper (Dunlop Research Centre). The course will include informal discussions, visits to the institute's polymer research laboratories and a showing of films. The fee is £2 5s.

Mr J. K. Davies has been appointed assistant secretary of BTR Industries.

Review

REPORT ON CAUSES OF RUNNING NIP ACCIDENTS AND SUGGESTED MEANS FOR THE PREVENTION OF SUCH ACCIDENTS. — Engineers' Advisory Committee, Accident Prevention Committee for the Rubber Industry. (National Joint Industrial Council for the Rubber Manufacturing Industry, Manchester, 1959, pp. 79. £1 1s.)

A running nip exists wherever sheet material passes on to a roller or bar. Running nips appear on a wide variety of machines used in the rubber industry, the more common ones being liner feeding and stripping machines, calenders used for impregnating and frictioning, and bias-cutting, spreading, printing and doubling machines.

In the first part of the report, running nip accidents are analysed and the principles involved in the prevention of these accidents are discussed. Running nips constitute a serious hazard, for in the UK during the period 1948 to 1955 there were 113 accidents of this kind in which the person involved in each accident was incapacitated for three days or more. This total excludes accidents on hose-making machines, braiding machines, tyre bead-making machines, and accidents where the operative was caught by rotating projections on batch rollers.

From a study of running nip accidents, the authors of the report conclude that the prevention of such accidents can only be achieved by conditions where the operative is unable to reach the running nip. Accordingly, the essential requirements in guarding running nips are specified by the authors in the form of two principles as follows:

1. The guard or system of guards should be such that it is impossible for an operative during the legitimate and proper working of the machine under normal speed and power to be able to reach with his hand or any part of his body or clothing the dangerous running nip.
2. When the guards preventing access to the running nip are opened or moved away so that such access is no longer completely denied, the machine must not be capable of moving under normal power or any other power that would cause other than relatively minor injury by trapping in the nip.

In the second part of the report, 14 typical examples of how types and combinations of guards have been applied to machines in common use in the rubber industry are clearly shown by means of some 50 photographs and diagrams. As an indication of the scope of these examples, they are listed below:

(1) Elimination of the hazard of a running nip between material being unwound from a roll and the floor. (2) An interlocking guard utilizing a mercury switch. (3) A photo-electric cell system for guarding a running nip. (4) and (5) Guards for bias cutters. (6) A sensitive bar as applied to a calender take-up. (7) A heavy duty spreading machine guarded by a combination of interlock and trip guards. (8) Guarding of a horizontal bias-cutting machine having a duplex reel off. (9) Guarding of a dipping and calendering unit. (10) A fabric processing machine in which the fabric is straightened and moved by mechanical devices. (11) A system of guarding a batching-up machine. (12) A single interlock guard. (13) A simple fixed mesh guard. (14) The attachment of short tapes to the corners of a liner.

The Accident Prevention Committee of the NJIC has an Engineers' Advisory Committee, and four members of the latter committee prepared the report. They are: S. F. Smith (Dunlop Rubber Co. Ltd.), H. Jackson (Leyland and Birmingham Rubber Co. Ltd.), M. A. McTaggart (representing H.M. Chief Inspector of Factories) and E. Morris (Greengate and Irwell Rubber Co. Ltd.). They are to be congratulated on a most useful contribution to safe-working in the rubber industry. The report deserves a wide circulation and should be studied by all those responsible for the safety of operatives using equipment with running nips.

R.W.P.

∴ Copies may be ordered through the Books Department, RUBBER JOURNAL AND INTERNATIONAL PLASTICS, Maclaren House, 131 Great Suffolk Street, London, S.E.1.

Danish Rubber Imports

Danish imports of crude rubber during November totalled 457,200 kilos, compared with 677,400 kilos in October, the Copenhagen Department of Statistics reports. Britain delivered 340,531 kilos, Holland 47,300, the United States 25,440, and Belgium-Luxembourg 24,800 kilos. West Germany supplied 10,299 kilos and the remainder came from Malaya and Sweden. Total imports during the January-November period were 6,168,700 kilos compared with 6,017,700 kilos a year before.

November imports of synthetic rubber amounted to 152,800 kilos, bringing the January-November total to 1,162,200 kilos against 1,082,000 kilos during the corresponding period of 1957. Of November imports, the United States delivered 61,001 kilos, Canada 58,520, and Holland 31,353 kilos. Britain, Sweden and West Germany accounted for the remainder.

NCRT Visits Fort Dunlop

A PARTY of second year associateship students led by Dr F. H. Cotton and two of his lecturers, Mr K. Saunders and Mr D. A. Smith, visited Fort Dunlop at the invitation of the Dunlop Rubber Co. Ltd. on January 8 and 9. A very full programme of visits, talks and discussion had been arranged which allowed us fleeting glimpses of the mill department, fabric preparation, motor cover production, and tubes. Testing facilities for tyres occupied us rather longer and we were shown a little of the work in progress at the nearby Research Centre.

Talks by senior members of Dunlop were concerned chiefly with organization and management rather than with technical matters, and the company went out of its way to assemble panels of managers to answer questions and contribute to general discussions. From the staff point of view, these discussions were of the utmost value in allowing an exchange of views between the College and the industry it serves. It was a pity that student contributions to the discussions were from a relatively small number of those present and it may be that in future visits, final year students will benefit more from these opportunities, since they will be nearer to the dread reality of having to earn a living!

However, bearing in mind that some of those present had no experience of factory work whatsoever, it was clear from their subsequent conversation that the visit had given a useful introduction to the many and varied opportunities in the industry which are available to students on graduation.

In retrospect, the most important facet of this successful visit was its method of organization. We at the College are used to approaching firms in the rubber industry with a request to allow a party to visit their works and learn something of their methods and organization. For the first time, the approach in this instance was by the firm itself and it was clear from the attitude of their staff that the Dunlop organization takes the training of technical men seriously.

So often in industry one meets the attitude 'they'll learn on the job'—or 'we can teach them all they need to know,' and it was refreshing to note Fort Dunlop's clear recognition of the function of this College, to provide a properly balanced basic technology course to act as the peg on which industry may hang the various clothes of its detailed processes and organization.

In expressing our thanks to the company for their hospitality, we are glad to put on record an important advance in the closer liaison between the National College and the polymer industry.—D.A.S.

Dunlop Sales Changes

Three new appointments are announced by Dunlop's National Sales Division, which is responsible for the company's mileage accounts. Mr R. Perry becomes manager for the south of England, based on London; Mr N. A. Selman manager (north), based on Manchester; and Mr S. C. Weeks manager (west), based on Bristol.

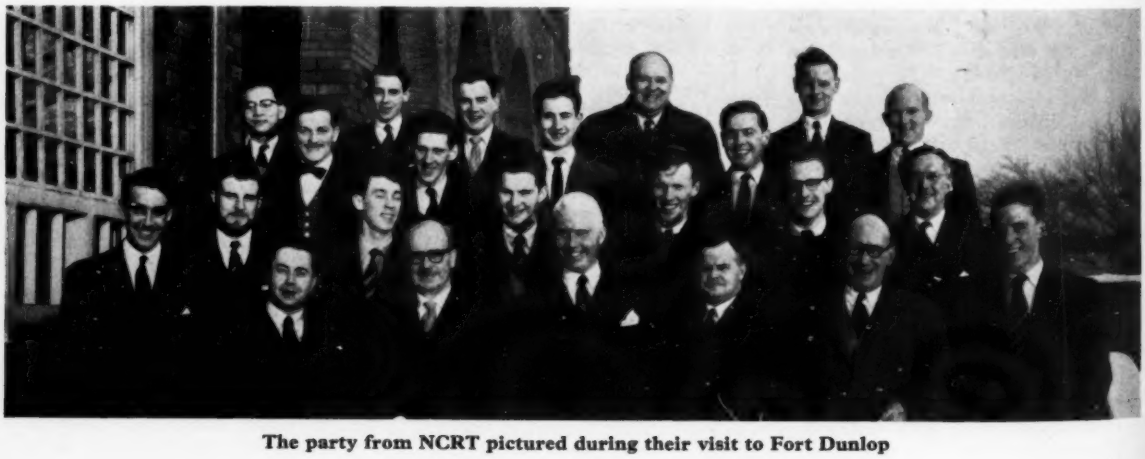
Mr J. Burden has been appointed chairman of Siginting (Negri Sembilan) Rubber Estate, Ratanui Rubber and the Anglo-Sumatra Rubber Company. He succeeds Mr W. V. S. Sinclair, who has resigned as chairman.

PIRELLI CHANGES

Several of the activities of Pirelli Ltd. are affected by the following managerial changes: Mr C. T. Kitching, *top left*, has been appointed personnel manager and takes over full control of the department which he

joined as personnel officer in 1956. Mr M. F. R. Potter, *top right*, has been appointed buying manager in charge of the supply organization which is responsible for the purchasing for Pirelli Ltd. as well as on behalf of the International and Italian groups of Pirelli Ltd. Mr F. Lee, *bottom left*, has been appointed manager of the resilient webbing department at the Burton-upon-Trent factory. Mr S. Upham, *bottom right*, has been appointed factory accountant at Burton-upon-Trent.

Mr Harvey S. Firestone has been elected chairman of the board of directors of the Firestone Tire and Rubber Co. in the US.



The party from NCRT pictured during their visit to Fort Dunlop

IRI EXAMINATIONS

Continued from page 167

RUBBER TECHNOLOGY I

The general level of papers in the Rubber Technology examination can only be described as fair, although there were a few very good papers.

As reported on former occasions, there is still a tendency for weaker candidates to appear to avoid answering the questions and to introduce irrelevant information into their replies. The Examiners are trying to ensure a good standard of technical proficiency in candidates, which implies a logical and methodical attack on problems. Unfortunately, we find that quite a number of candidates do not have this approach.

We welcome any information given by a candidate which shows that he understands the fundamental reasons for the choice of materials or processes which he describes. It is not enough to state the name of the proprietary materials or machines; the candidate should also give a chemical formula or technical description which will show that the object described is not just a name to him.

We must again point out that we are anxious to award all the marks we can. Most of the candidates who have low marks have handicapped themselves by answering only three or four questions, or, in answering five questions, by omitting large portions of individual questions.

Comments on the answers to individual questions are given below:

Q. 1. *Describe developments in recent years in the direct moulding of rubber to leather in footwear manufacture. Give typical mixes and discuss the compounding problems.*

This question was not popular and was not well done. The mixes quoted were not suitable for the application, as in most cases candidates thought that they should be 'resin rubbers.' No candidate mentioned the 'bloom' trouble that may occur and the complications of this in the compounding.

Q. 2. *What advantages and disadvantages resulted when organic accelerators were first used in the factory. Discuss the advantages of using mixtures of organic accelerators.*

A popular question but not very well done. Few candidates explained clearly the synergistic effect with two accelerators.

Q. 3. *Describe the production of 'cold' butadiene-styrene rubber. What problems would be encountered in changing a small factory making mechanical goods and small hand-built products (such as football bladders) from working with natural rubber to working with butadiene-styrene rubber.*

A popular question. Part one of the production of S/B rubbers was well done but a number of candidates spent too long on it and, as a result, skimped the second part.

Q. 4. *Write a specification for an acrylonitrile rubber gasket to be used in compression with its outside edge exposed to the external atmosphere at a very low temperature and its inside edge immersed in hot oil. Your specification should contain as an appendix one mix which would have the specified properties.*

Not a popular question and not well done. Few candidates showed evidence of knowing how a specification for rubber should be drawn up. None of the candidates mentioned the possible trouble with ozone cracking of the exposed side of the gasket.

Q. 5. *Compare and contrast* either (*a*) *a fluorine containing elastomer with silicone rubber* or (*b*) *chlorosulphonated polyethylene with butyl rubber. Include processing properties and properties of the vulcanizates.*

Quite a popular question and on the whole well done. Nearly all candidates selected alternative (b).

Q. 6. *What are the various factory processes in which scorching can occur? Describe the symptoms which would lead you to suspect scorching in these processes? What steps can be taken to prevent it? Describe briefly the laboratory tests to assess scorching tendency.*

A popular question and quite well answered. There was some confusion in a few candidates' minds about how compression plasticity tests may be used for assessing scorch.

Q. 7. *Describe the continuous vulcanization method of electric cable insulation and sheathing. What are the requirements in the rubber compound for successful operation.*

A popular question and quite well done. Not many candidates actually quoted a compound in part 2; it would have been easier to assess their ideas had they done so.

Q. 8. *Describe laboratory methods used to simulate and assess the deterioration of:* (*a*) *rubber proofings in sunlight, and* (*b*) *stretched vulcanized rubber in air containing ozone.*

Not a popular question. A few candidates answered very well and the rest very badly.

RUBBER TECHNOLOGY II

Q. 1. *Give the composition and discuss the application of substances which have the following effects on unvulcanized rubbers:* (*a*) *peptizing,* (*b*) *stiffening.*

What are the chief economic and technical advantages to be gained from their use?

This question, dealing with peptizing and stiffening agents, was attempted by about half of the candidates. Peptizing was fairly well treated but the application of stiffening agents in such problems as the compounding of butyl rubbers or the stiffening of extruded shapes was not often mentioned.

Q. 2. *Discuss automation in the rubber industry. Give examples in the fields of each of the following:* (*a*) *compound preparation,* (*b*) *vulcanization,* (*c*) *trimming and inspection.*

This discussion of 'automation' was not a popular question and was answered by only 40% of the candidates. In general it was quite well answered and good appreciation of both the economic and the personnel problems involved was displayed.

Q. 3. *You are required to make 24 in. lengths of a translucent rubber tubing of hardness 35 BS°, inside diameter 0.250 in., outside diameter 0.500 in. What methods would you employ in compounding and processing? Suggest practicable tolerance limits on size and hardness.*

This question was of a 'practical' nature and capable of being satisfactorily answered in several ways. It was a fairly popular question attempted by 70% of candidates. The compounding information was of a fair standard but some answers, after stating that a 'pure gum' compound was required, went on to specify a mix which contained up to 40% of magnesium carbonate or finely divided silicas, which would be too hard. Several answers did not include any recommended vulcanization conditions.

On the other side, it was gratifying to learn that many candidates knew of superior processing rubber as an aid to extrusion and that they also referred to its composition and preparation. Candidates who recommended a latex process or direct moulding were given due credit according to the quality of their answers.

Q. 4. *Describe recent developments in textile materials for use as structural components in tyres. Discuss the problems of adhesion.*

Candidates were asked to describe recent developments in textile components of tyres, and about 60% attempted the question. Most answers dealt only with the carcase cords, but breakers, chafers, beads, etc., were rarely mentioned.

Rayon received good attention, but nylon, 'Terylene,' steel wire, etc., were only lightly touched on. The adhesive process for rayon cord was generally well described.

Q. 5. *How would you make rubbers with:* (*a*) *the highest electrical resistance, and* (*b*) *the lowest electrical resistance.*

How would you measure the volume resistivity in each case?

This question, dealing with electrical resistance and conductivity, was answered by a little over half the candidates. The quality was very uneven, particularly in relation to compounding. The details of testing procedure were generally correct but few gave an indication of the values which they would expect from the compounds stated.

Q. 6. *What surface treatments are used to lessen the tack of unvulcanized rubber and surface drag of vulcanized articles? Indicate the particular applications of each treatment.*

This question, dealing with surface treatments, was the least popular and only about a third of the candidates tackled it. On the whole it was poorly answered without proper discrimination between the various treatments. Some of the weaker students seemed to use it for a last and desperate answer in the paper.

Q. 7. *Discuss reinforcing ingredients for coloured rubbers including both organic and inorganic materials.*

This was a popular question, relating to reinforcing ingredients. About 85% of the candidates attempted it and many gained high marks.

Q. 8. *Describe three methods of concentrating natural latex.*

Discuss the factors which determine the choice between these three types for given processes and products.

This question about latex was easily the most popular and every one submitted an answer. The descriptions of methods of concentration were of a better standard than the discussions of processes and products. However, the subject had evidently been well studied and most of the candidates gave good answers.

E. H. HURLSTON.
R. C. MOAKES.

ESSAY

It is pleasant to report that there was less tendency to include the irrelevant. There was a commendable improvement in handwriting and punctuation compared with previous years, but candidates would gain more marks if they helped their readers by concluding each paragraph in such a manner as to lead into the next.

The usual mis-spellings occurred, as did the confusion between 'effect' and 'affect,' it's and its, -ible and -able. Such phrases as 'in the region of' (=about), 'as to whether' (=if), 'due to the fact that' (=because), 'having the edge,' 'get it across,' 'such things as' are best avoided.

1. *An ideal rubber* (10 essays).

The essays submitted were of very variable quality. One candidate, however, is to be highly commended for a well-balanced, critical discussion.

2. *Quality control* (18 essays).

This was by far the most popular essay, but not all candidates gave an adequate description of the use of quality control charts which is what the Examiners sought. BSI and ASTM received scant mention.

3. *Advice to your son who has decided to enter the rubber industry* (9 essays).

Some very mature advice was proposed. Preference for full-time and part-time studies seemed equally divided, but the cultivation of good personal relationships was frequently missing.

4. *The impact of plastics upon the rubber industry* (6 essays).

One candidate covered what was intended to be a wide field very well. The approach of some others was far too limited.

5. *The role of the plant breeder in natural rubber production* (1 essay).

Interesting matter was rather spoilt by its presentation.

6. *Petroleum chemicals* (3 essays).

It did not appear to have occurred to the candidates that what the Examiners hoped for was treatment of the broad field of petroleum chemicals, not a detailed description of synthetic rubber manufacture.

7. *Science, Technology and Economics* (2 essays).

This subject has possibilities which the two candidates missed.

8. *Standardization* (2 essays).

One candidate showed originality in his ideas.

9. *National Self-Sufficiency* (No essay).

It is a pity that no one attempted this subject which offered plenty of scope to technologists who realize the importance of economics.

Noting the apparent blindness of technologists to the economic implications of their activities, the Examiners will feel justified in repeating this kind of question in future years.

J. H. CARRINGTON.
F. C. JENNINGS.

LANGUAGES

The quality of most of the translations was very disappointing in layout, grammar and accuracy of subject matter. Candidates would do well to begin by getting a rough idea of what the passage is about; they would then have a better chance of translating in the proper context.

FRENCH: 'Bande de roulement' (tyre tread) — deliberately included because of last year's results — was translated, when not completely ignored, as 'milled,' 'revolving belt,' 'rolling belt,' 'stretched condition,' and even as 'stick to the rolls.'

'Résistance à la rupture' (tensile strength at break) usually came out as 'cracking resistance,' 'tensile stress,' 'tear resistance,' 'resistance to rupture,' or some such variant.

'Cuireux' (leathery) appeared as 'curious' (curieux) and 'waxy' (cireux).

GERMAN: 'Hochspannungsgeräte' (high-tension apparatus)—clearly electrical from the context—was translated variously as 'tensile testing,' 'high extension,' 'high tension recovery,' 'high stability,' etc.

'Quelle' (source) was confused with 'quellen' (to swell).

'An Stelle, wo' (at places, where) appeared as a 'substance,' 'submitting,' 'on standing' and 'the placing.'

R. J. MOSELEY.

PRACTICAL

On the whole the standard of practical work showed some improvement on previous years and many candidates set about their tasks in a workmanlike manner.

This year there were a number of neat, well-laid-out scripts and, in many cases, the standard of English was very good. There were, however, other papers which left much to be desired and there is room for further improvement in the presentation of results.

As in previous examinations, too, many candidates failed to give full details of their physical testing. Thus, some merely presented average tensile data, others give individual results in addition to the average, instead of giving all the relevant measurements leading to the calculation of the final result.

Polymer characterization gave little trouble, but candidates were less proficient in the analysis of rubber chemicals present in a mix. Thus a mixture of an accelerator (DPG) and a peptizing agent (thio-β-naphthol) appeared to be beyond the capabilities of most of the students who attempted this question. Many candidates failed to find lead in a butyl compound cured with quinone dioxime and red lead, presumably due to overheating during incineration which reduced the oxide to metallic lead due to the presence of carbon.

Questions on the identification of carbon blacks and assignment to mixes were, on the whole, reasonably well answered, but many students used the specific gravity of their unvulcanized stocks to estimate black loadings, in spite of the fact that they were obviously porous.

We are pleased once again to record our appreciation of the helpful co-operation and supervision of the teaching staffs and invigilators at the National College, Newton Heath, and in India.

H. C. BAKER.
B. J. HABGOOD.

LICENTIATESHIP

Of the Licentiateship examination 1958 the Chairman's comments are:

Of the 44 candidates who failed this year, 15 did so in one paper (seven in Rubber Technology I, four in Rubber Technology II and four in Rubber Technology III), 20 failed in two papers (three in I and II, six in II and III, 11 in I and III) and nine failed in all three papers.

In Rubber Technology I (Applied Science) and in Rubber Technology III (Chemistry and Physics) the candidates showed an improved performance compared with 1957, but in Rubber Technology II (Works Practice) this trend was reversed. Candidates would do well to take note of the Examiner's comments.

RUBBER TECHNOLOGY I

Applied Science

The standard of papers, especially in presentation, shows a welcome improvement over recent years.

Q. 1. *Outline the steps in the production of neoprene from acetylene and*

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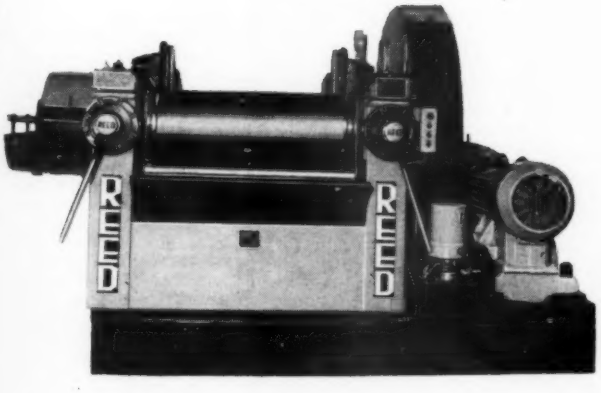

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hydrogen chloride. Compare and contrast neoprene with natural rubber with respect to (a) compounding, (b) processing, and (c) properties of vulcanizates.

(70 answers.) This question produced some very good answers, but a surprisingly large number of candidates ignored the first part, on the production of neoprene, altogether. In some cases compounding was taken to mean only behaviour during milling.

Q. 2. *Calculate the amount by weight of china clay (SG* 2.60) *necessary to reduce the rubber content of the following mix to* 50% *by volume:*

	Parts by weight	Sp. gr.
Rubber	100	0.93
Zinc oxide ..	5.0	5.6
Carbon black ..	30.0	1.80
Stearic acid ..	2.5	0.9
Accelerator ..	0.5	1.5
Sulphur ..	2.5	2.1

What is the specific gravity of the above mix, and what would it be after the addition of the china clay?

(90 answers.) This arithmetical question was handled satisfactorily by most candidates. The standard of presentation was higher than in recent years.

Q. 3. *Describe the effects produced on the properties of (a) an unvulcanized natural rubber stock containing only the necessary vulcanizing ingredients and (b) the vulcanizate, by the following additions, the amounts given being parts by weight per* 100 *parts of rubber: (i)* 50 *parts HAF black, (ii)* 80 *parts ground whiting, (iii)* 80 *parts precipitated calcium carbonate, (iv)* 80 *parts colloidal china clay, and (v)* 170 *parts zinc oxide.*

(56 answers.) The behaviour of blacks and clay was well understood, but there was much evidence of muddle over zinc oxide, whiting and precipitated calcium carbonate.

Q. 4. *Explain what you understand by any* four *of the following: (a) reinforcement, (b) abrasion resistance, (c) antioxidant action, (d) peptization, (e) heat sensitization of latex.*

Give two examples in each case selected of materials which can be added to rubber to produce these effects.

(94 answers). Reinforcement, abrasion resistance, and antioxidant action were adequately dealt with, but peptization and heat sensitization produced some very poor answers. Some candidates did not distinguish between peptizers and straightforward plasticizers; others were confused over heat sensitizers and delayed action coagulants.

Q. 5. *Discuss the relative merits of three different methods for estimating the volume swelling of a vulcanizate in benzene. Describe one of the methods in detail.*

A strip of vulcanizate of unswollen length 10 *cms. increases in length by* 50 *mm. by swelling. Calculate the percentage swelling by volume, stating any assumptions made.*

(23 answers.) Relative merits were often poorly dealt with. Several candidates would risk explosion with benzene in an oven at 70°C. The formula misprinted in BS 903 (Part A16: 1956, p. 8) was quoted without correction in one answer. The most common result of the calculation was 50% (seven answers), and only two correct results (238%) were obtained.

Q. 6. *Show by sketch graphs the effect of temperature, in the range from* —70 *to* +100°C. *on the hardness and resilience of vulcanizates from* four *of the following: (a) natural rubber, (b) butadiene-styrene* 75/25 *copolymer, (c) neoprene (general purpose grade), (d) butadiene-acrylonitrile* 70/30 *copolymer, (e) butyl rubber.*

Indicate how the effects would depend on filler loading and plasticizer content.

(15 answers.) Most answers did not show correctly the approximate forms of temperature dependence and included longhand description which was not required. Slow changes due to thermal ageing were not distinguished from the immediate effects of high temperature measurement of the properties. There was little clear demonstration of the differences between the rubbers, except for the individuality of butyl. Indication of the dependence on filler was inferior to that on plasticizer.

Q. 7. *Explain how, by visual examination of a used tyre, to tell as far as possible which processee during service have caused the various kinds of surface fissure or roughness which may occur.*

Describe a standard method of testing a composition for the resistance of its vulcanizate to one of these processes.

(51 answers.) The first sentence was designed to be mainly on the recognition of exposure cracking, crazing, flex-cracking and abrasion pattern, taking tyres as a specific example. The descriptions of form, orientation and location were usually insufficient to permit identification.

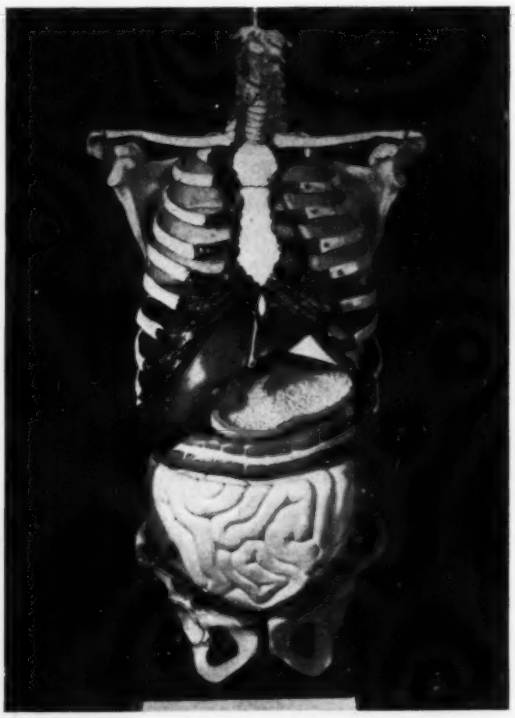
It was often not realized that the distention due to inflation is largely radial, resulting in circumferential exposure cracks, and there was considerable muddle about the causes of exposure cracking and crazing. Abrasion pattern was seldom mentioned, although the question excluded abrasion leaving a smooth surface. The importance of tread groove cracking appeared to be generally unknown.

Q. 8. *Describe methods used to determine* three *of the following in preserved* Hevea *latex: (a) ammonia content, (b) dry rubber content, (c) mechanical stability, (d) coagulum.*

(70 answers.) It was not generally realized that ammonia content should be expressed as a percentage of the water content and not of the whole latex. The method for total solids was sometimes described for dry rubber content, and many DRC descriptions quoted 1½ hours drying at 98-100°C. Coagulum was usually obtained by drying (eight answers) or acidification (seven answers) instead of sieving (two answers).

D. A. W. IZOD.
G. N. WELDING.

(To be continued)



An extensive range of anatomical models for medical and educational purposes is being produced by Educational and Scientific Plastics Ltd., Hooley, Coulsdon, Surrey. The models, made throughout in rubber and plastics, are designed to simulate in every possible way the 'genuine article.' The company's most recent development is the 'Skeletorso,' *left*, which is so constructed that it can be dismantled piece by piece for detailed study. The company, which came into being ten years ago, has an extensive world market

Rubber Statistics

LATEST OCTOBER FIGURES FOR NATURAL AND SYNTHETIC

THE most recent information released by the Secretariat of the International Rubber Study Group brings the production and consumption figures for natural and synthetic rubber up to the end of October. In the following table, which is expressed in 1,000 long tons, the natural rubber production position at the end of October is compared with the similar position at the end of October 1957:

NATURAL PRODUCTION

	Jan./Oct. 1958		Jan./Oct. 1959	
Malaya:				
Estates ..	317½		302½	
Smallholdings	222½		224½	
		540		527
Indonesia:				
Estates ..	195		209	
Smallholdings	288		375	
		483		584
Ceylon ..		79½		78½
Thailand ..		120		106
Sarawak ..		31		33½
Other British Borneo		17		16
Liberia ..		34		30
India		18		18
Belgian Congo		27		27
Others ..		143		212½
		1,492½		1,632½

The shortfall in production on Indonesian smallholdings, to which reference has been made previously, still continues, while a 5% increase is recorded in the case of Malayan estates and a 13% increase in the case of Thailand, though the latter may only be temporary. The Study Group estimated earlier in the year that production in 1958 would slightly exceed the 1957 total of 1,902,500 tons, but at the end of October it was already lagging 140,000 tons behind, and the forecast seems unlikely to be fulfilled.

The following table shows the natural rubber consumption during these ten months:

NATURAL CONSUMPTION

	Jan./Oct. 1958	Jan./Oct. 1957
UK	144	148
USA	395	456½
France	112	111
Western Germany	110	116
Remainder of Europe	398	308
Others	473½	448
	1,632½	1,587½

Although the official statistics show a shortfall in production of natural rubber, this is certainly not reflected in the figures for consumption, where the 1958 totals to the end of October already exceed those for 1957 by 45,000 tons. Part of this increase is undoubtedly due to the considerable increase in purchases of natural rubber by Eastern European countries, notably Russia, during the last few months.

Synthetic Rubber

The decline in US rubber consumption, which is now reported to have been halted, is clearly reflected in the above table, and also in that for synthetic rubber consumption which follows. The decline in each case is roughly the same, *i.e.* some 60/70,000 tons, whereas the overall US consumption of synthetic rubber remains nearly double that of natural rubber, so that the decline in consumption of natural rubber has been comparatively very much steeper than that of synthetic.

SYNTHETIC CONSUMPTION

	Jan./Oct. 1958	Jan./Oct. 1957
UK	51	46
USA	708	783
France	45	40
Western Germany	42	39
Remainder of Europe	45	48
Others	106½	101½
	997½	1,057½

British Standards

Testing Vulcanized Rubber

This new publication, 'Methods of Testing Vulcanized Rubber' (BS 903), Part B19: 1958 — 'Preparation and Examination of Water Extract,' is part of the revision and publication in separate parts of BS 903 (Methods of testing vulcanized rubber). It deals with the preparation and examination of water extract and replaces Part 12 of the 'one-volume' edition published in 1950.

As well as specifying the method of preparing the water extract, the eight-page publication provides detailed methods for determining: Total water soluble materials, electrical resistivity, free acid or free alkali, pH value, chloride, sulphate, ammonium salts.

Copies of this Standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1. Price 3s.

Columbian Carbon Director

Mr Hans Stauffer has been elected a director of the Columbian Carbon Company, it was announced on January 23 by Mr L. L. Shepard, president. Mr Stauffer is president of the Stauffer Chemical Company as well as director of a number of other chemical companies.

Export Opportunities

Hospital Goods for Cuba

Audrain y Medina of Neptuna 524, Havana, have informed the British Embassy at Havana that they are anxious to contact United Kingdom exporters of hospital goods of all types with particular reference to rubber catheters. Audrain y Medina have been established for many years as importers and distributors of medical supplies. They are considered to be a suitable connexion for United Kingdom firms.

Exporters interested in this enquiry should write direct to the Havana firm and notify the British Embassy, Commercial Secretariat, Apartado 1069, Havana, that they have done so. Board of Trade Reference No. ESB/731/59.

Motor Cycle Tyres and Tubes for Burma

The Director-General, Union of Burma Purchase Board, St. John's Road, Rangoon (Quotation No. IIIA/61/P & M of 58-59), has issued the following requirements: 10 sets of tyres and tubes 3.50 x 19 for motor cycles. Closing date is February 9.

A copy of the tender documents may be inspected in Room 620 at this branch until January 29, after which date it will be available for loan. A photo-copy set can be purchased from the branch for 2s. Board of Trade Reference No. ESB/2315/59.

Tyres and Tubes for Ceylon

The Chairman, Tender Board, Ceylon Transport Board, 200 Kirula Road, Colombo 5, Ceylon, has issued the following requirements:

Pneumatic tyres and inner tubes required for use in passenger transport commercial vehicles (omnibuses) as follows:

Size of tyre	Ply rating	Approx. quantity of tyres reqd.	Approx. quantity of tubes reqd.
1,100 × 20	14	600	500
900 × 20	12	600	300
900 × 20	10	4,000	2,000
825 × 20	10	5,000	2,500
750 × 20	10	6,500	3,000
700 × 20	10	2,200	1,100
750 × 16	8	800	400
700 × 16	8	250	125
650 × 20	8	150	75
600 × 20	8	150	75
650 × 16	8	150	75

The closing date is February 25.

A limited number of copies of tender documents is available in this branch for distribution to United Kingdom firms interested in this call for tenders. Board of Trade reference No. ESB/1901/59.

The address of the Export Services Branch of the Board of Trade is Lacon House, Theobalds Road, London, W.C.1. Telephone number: Chancery 4411, extensions 776 or 866.

The Industrial Welfare Society has received a cheque for £150 from the Dunlop Rubber Company.

Rubber Crop Returns

HARRISONS AND CROSFIELD LTD.

	December 1958 lb.		No. of mths. of fin. year to date	Fin. year to date lb.	
Sumatra					
Allied Sumatra	905,870	(801,813)	12	9,570,157	(9,707,587)
Asahan	130,072	(127,867)	5	623,902	(707,676)
Bah Lias	176,368	(238,097)	2	341,713	(469,580)
Central Sumatra	92,593	(101,411)	6	558,866	(639,334)
Lankat Rubber	69,445	(65,036)	9	562,614	(556,661)
Mendaris	222,665	(227,688)	12	2,392,661	(2,253,974)
Namoe Tongan	286,598	(263,450)	4	1,095,686	(1,061,515)
Sialang	223,767	(211,421)	11	2,119,061	(2,165,415)
Soengei Rampah	59,524	(50,706)	12	602,517	(565,052)
Tanah Datar	76,500	(82,673)	12	917,555	(936,188)
Tandjong	158,731	(153,050)	6	901,619	(881,949)
Toerangie	233,687	(220,460)	2	445,329	(454,148)
United Lankat	32,408	(29,762)	12	368,058	(392,328)
United Serdang	1,002,432	(1,047,626)	4	3,992,531	(4,359,155)
Malaya and Borneo					
Bukit Prang	33,000	(45,000)	9	304,000	(341,000)
Castlefield	294,000	(203,800)	6	1,410,500	(1,259,500)
Golden Hope	846,200	(617,100)	10	6,468,200	(6,197,700)
Holyrood	92,000	(77,300)	12	801,500	(785,300)
Hongkong	31,000	(18,600)	12	257,300	(200,600)
Hoscote	289,800	(219,700)	6	1,464,500	(1,448,400)
Killinghall	55,000	(35,500)	6	257,100	(219,800)
Klanang Bahru	33,500	(34,000)	10	283,500	(390,000)
Kuala Selangor	64,000	(48,000)	12	609,000	(576,000)
Kulai	242,000	(136,000)	2	411,000	(293,000)
Lanadron	499,100	(406,500)	12	4,825,600	(4,464,500)
London Asiatic	1,863,300	(1,335,200)	12	17,121,500	(14,961,500)
Malaysia	68,500	(55,500)	12	667,000	(590,000)
New Crocodile	287,000	(250,500)	10	2,384,000	(2,035,000)
Pataling	1,418,000	(995,500)	2	2,523,500	(2,014,000)
Prang Besar	230,200	(154,800)	9	1,655,100	(1,437,500)
Sandac	82,000	(75,000)	9	665,000	(645,000)
Sapong	162,000	(146,000)	12	1,654,000	(1,374,000)
Seaport	90,000	(80,000)	6	475,000	(476,000)
Strathisla	130,000	(90,000)	6	651,000	(545,000)
South India and Ceylon					
Malayalam	997,700	(824,300)	9	5,932,600	(5,807,900)
Lunuva	159,350	(137,277)	12	1,475,562	(1,464,637)
Java					
Bajoe Kidoel	183,506	(179,167)	8	*1,665,571	*(1,732,688)
Djasinga	127,525	(129,009)	5	575,560	(611,997)

* Including adjustment

SHARPE, ESTALL AND CO. LTD.

	Fin. year ends	December 1958 lb.		Fin. year to date lb.	
Anglo-Johore	July	68,600	(31,800)	297,150	(236,900)
Batang C.R.E.	March	119,247	(76,000)	758,393	(612,000)
Bekoh C.R.E.	March	238,000	(173,000)	1,826,000	(1,502,000)
K.P.R.P.	March	68,000	(12,500)	465,200	(380,300)
Rim (Malacca)	June	275,000	(168,000)	1,380,500	(1,104,200)
Sittang Valley	June	163,420	(190,960)	639,020	(751,100)
Kurunegala	December	30,570	(21,530)	335,600	(270,428)

Dunlop Closing Stoke Plant

About 400 workers at the Dunlop Rubber Co.'s works at Etruria, Stoke-on-Trent, will be affected by a decision to transfer the production of tyre remoulds from there to other factories within the group. The announcement that the Stoke factory is to close during the next two years is made to give employees an opportunity to obtain other employment. During the closing-down period, as many as possible of the longer-service employees will be offered work at the company's other factories.

Creditors Meeting

REMAFA (GREAT BRITAIN) LTD., 82 Portland Place, London, W.1, plastic materials merchants.

The first meeting of creditors of the above company was held on January 6 at Inveresk House, Strand, W.C., when Mr A. T. Cheek, Official Receiver, reported that the gross liabilities had been estimated at £6,900, of which £30 was preferential, £940 the claim of a shipper who was said to hold a lien on stock, and the balance was due to unsecured creditors.

The company was formed in February 1957 with a nominal capital of £10,000, all of which had been issued, to take over a business previously carried on in Chelmsford. The company traded from Boleyn Road, Kingsland, N.16.

Mr Kenneth Leslie Wood was the only director in office at the date of the winding-up order. He was appointed in August last, when Mr L M. G. Ballintijn and Mr G. M. Ballintijn both resigned from the board. Messrs. Ballintijn had not been interviewed, said Mr Cheek, and they were believed to be in Holland.

The company was incorporated to control the sale in this country of products exported here by a Dutch firm. Mr Cheek said the company lacked capital and an arrangement was made with a finance house to assign book debts.

According to Mr Wood the company assets comprised the stock held by the shipper. He had estimated it would realize about £2,600.

Creditors passed no resolution and the case was left with the Official Receiver as liquidator.

Canadian Asbestos

Shipments of asbestos from Canadian mines in November reached a monthly high for the year 1958 at 107,072 tons, comparing with 98,293 in the preceding month and 93,770 in November 1957. January–November shipments at 862,550 tons were substantially below the year earlier total of 995,897. Exports fell in November to 82,144 tons from 90,185 in the same month of 1957, and in January–November to 785,244 tons from 946,010.

A range of new packings for marine and industrial use, not previously exhibited, are to be shown on the stand of Beldam Asbestos Co. Ltd. at the Engineering Marine, Welding and Nuclear Energy Exhibition, Olympia, London, April 16–30. Film Cooling Towers (1925) Ltd. will show a new small induced draught cooling tower in polyester resin-bonded glass-fibre units.

PATENT SPECIFICATIONS

The following information is prepared from published Patent Specifications. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 3s. 6d. per copy (including postage).

Injection Moulding Machines

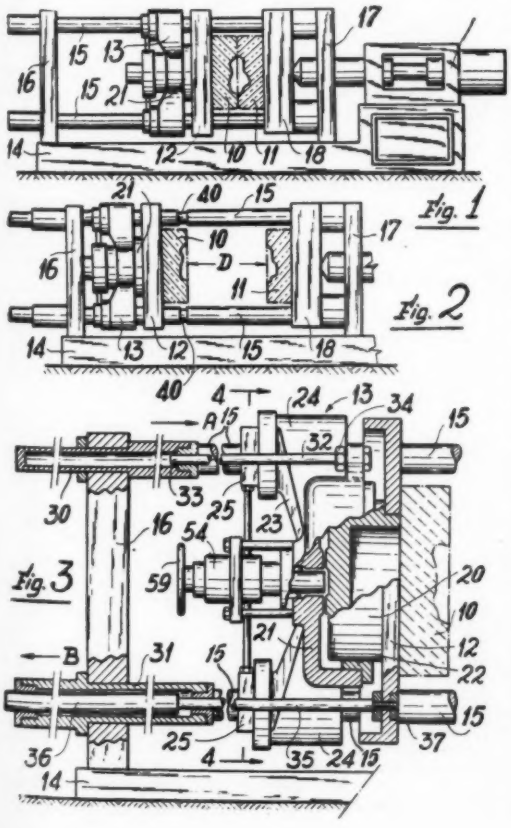
No. 803,553. F.I.M.S.A.I.S.r.l., Fabbrica Italiana Macchine Stampaggio ad Iniezione. Application and Filed, August 2 1955. Application in Italy, May 12 1955. Published, October 29 1958.

The invention relates to injection moulding machines for plastics, particularly to machines of large size and power.

Figs. 1 and 2 are side views of the machine in a closed and open position of the mould respectively, while Fig. 3 shows on a larger scale an example of the movable unit and of the mechanism associated with it.

As shown in Figs. 1 and 2, movable part 10 and fixed part 11 forming jointly the mould are carried respectively by a movable plate 12 and a fixed plate 18, part 10 being attached to a movable unit 13 including one or more power pistons and one or more cylinders. The unit is supported for movement on the frame 14 of the machine, preferably by means of supporting and guiding rods or columns 15 carried at their ends by structural and stationary parts 16 and 17 connected to the frame 14. Hence the movement necessary to place the two mould parts 10 and 11 at the distance D (Fig. 2) and to bring them back to an adjacent position, does not correspond necessarily to the stroke of the power piston, as in known machines, but to the movement of the unit 13 along columns 15. Before applying pressure to the hydraulic power system, the unit 13 is rigidly fastened in a position wherein mould part 10 is adjacent to mould part 11, for instance locked at points 40 of columns 15. The locking mechanism is described fully in the Specification with the aid of drawings.

In the example shown in Fig. 3, the machine comprises one single piston 20 of large diameter but of small axial length connected to the movable plate 12, on which mould part 10 is fixed and which is supported and guided slidably on columns 15. In consequence of the small length of piston 20, its weight its balanced by the weight of mould part 10 so as not to lay heavily in any position on the joint packings 22 of cylinder 21, supported by unit 13 in which piston 20 is working.



Unit 13 is advanced in direction A towards the closed position of the mould by a system of hydraulic cylinders 30, the pistons 33 of which are extensions of rods 32 connected at 34 to the assembly comprising cylinder 21 and arms 23, while the opening movements of the mould are obtained by means of return jacks 31, working in direction B, and the pistons 36 of which are connected with rods 35, in their turn connected at 37 with plate 12. During closing movements of the mould, the cylinder pushes on the piston, and *vice versa* during opening movements of the mould.

During the opening and closing of the mould, there is practically no movement between the cylinder and piston so that the full opening and closing movements of the mould require only a little power and may be performed at a comparatively high speed.

Copolymers

No. 804,083. Chemische Werke Hüls A.G. Application and Filed, November 12 1956. Application in Germany, November 29 1955. Published, November 5 1958.

Diolefins with conjugated double linkages and alpha-olefins are copolymerized in the presence of mixed catalysts formed from an aluminium trialkyl compound and a titanium halide. Suitable diolefins are butadiene, isoprene, piperylene and 2,3-dimethylbutadiene, while suitable alpha-olefins are ethylene, propylene, alpha-butylene and styrene. The examples relate to the preparation of copolymers of ethylene with butadiene, ethylene with isoprene, and butadiene with alpha-butylene.

Shorter Abstracts

Pneumatic Tyres. 801,146. United States Rubber Co. Filed, August 22 1955.—A layer of strong wire cable is disposed on the upper crown surface of the tyre beneath the tread. The layer of wire has a diameter less than that which the carcass would otherwise assume when inflated so that the wire forms a restraining element. The tyre has a flat, wide tread affording better traction and reduced wear.

Impermeable Polythene Films and Containers. 801,419. Shulton Inc. Filed, September 13 1956.—Polythene films, sheets or containers are rendered substantially impermeable to gases and vapours by treatment with fluorine until the polythene films, sheets or containers have a fluorine content of 0.03 to 3.5%.

Curing Fluid Polychloroprene. 801,426. E. I. du Pont de Nemours and Co. Filed, February 18 1957.—Fluid polychloroprene (neoprene) containing sulphur is cured with the aid of a polyamine added in a proportion of 0.5 to 20 parts per 100 parts of the polymer. Examples relate to the use of fluid polychloroprene, treated with a polyamine, for the manufacture of printing rolls and sponge material.

Purifying Polyolefins. 801,554. Petrochemicals Ltd. Filed, May 11 1956.—Polythene and other polyolefins made by a low-pressure polymerization process are purified by vigorous agitation with an aqueous solution of a detergent. The treated polymer is freed from detergent by washing with water.

Rubber Compositions. 803,993. Dunlop Rubber Co. Ltd. Filed, May 20 1955.—Natural rubber is masticated in an internal mixer in the presence of not less than 10% of oil or other softener, the oil or other softener being present from the commencement of mastication. A satisfactory degree of plasticity of the rubber is thus achieved without serious effect on its molecular weight.

Rubber and Plastics Stock Market

A REVIEW OF PRICES AND TRENDS

THE London stock market is still behaving very cautiously, most of the buyers seem apprehensive about the present level of the Wall Street market and not without due cause. That market is now poised around the 600 level as registered in terms of the Dow Jones Index. This compares with around 440 at the low point of last year.

Certainly a rise at the low point appeared justified and it was apparent that when the rise occurred it would be followed in every step by London, but now the position has arisen that while a further rise on London is justified another leap ahead by Wall Street would not appear statistically correct. In fact the reverse is true, the market in America is due for a technical readjustment and the fact remains that any fall there would again be reflected by London prices.

Moves on the London market have therefore been mostly confined to the specific rather than the general. There has been selective demand for the leading industrials and there has been some support for shares which have been left behind in the recent rise and are showing a fairly high return.

The plastics section has claimed a fair amount of attention, but the outstanding features have been among the shares of the rubber manufacturers. LEYLAND AND BIRMINGHAM RUBBER £1 ordinary shares were a very strong market following the announcement of a share bonus to be made to existing holders on the basis of two new ordinary shares for every three already held. Also of importance was the news that investments in the company's offshoots have been revalued and showed a surplus of £707,000. The shares in steady stages climbed to a new high point for the 1958/59 period of 74s. 6d. before reacting slightly to around 73s. 9d. on profit taking. The low point here was 41s. and the share bonus news follows a much better full report than the market had anticipated.

There was some demand for the ordinary shares of the RFD group which left the price quite sharply higher at 4s. 9d. and a big buyer appeared for the 2s. ordinary of the ANGLO-AMERICAN VULCANIZED FIBRE concern. A rise here has been long overdue and one can only attribute the buying to a large order based purely on yield considerations. At one time the shares changed hands as high as 4s. 3d. but then the price reacted to around 3s. 9d.

P. B. Cow ordinary were bought up to 6s. which is only slightly below the peak price of 1958, again the very worthwhile yield still obtainable may have been the reason.

The announcement of lower profits from the BTR INDUSTRIES firm was already discounted by the shares. After the news the ordinary fell only 3d. to the 11s. mark.

The group profit is down from £1,295,000 to £749,000. Taxation takes some £400,000, compared with

Continued on page 183

Share Price Movements

Par Value	Company	1958-59 High	Low	Jan. 17	Latest
5/-	Albright & W. Ord. ..	21/3	13/4½	21/-	21/3
£1	„ „ „ 5% Pref...	16/7½	15/4½	16/-	16/6
5/-	Anchor Chemical Ord...	11/6	10/3	10/9	10/9
5/-	Andersons Rub. Ord. ..	4/3¾	3/-	3/1½	3/1½
2/-	Anglo-Amer. Vulc. Fibre Ord.	4/3	2/-	3/1½	3/9
£1	Angus Geo. Ord. ..	29/10½	21/-	29/9	29/3
5/-	Armitage (Sir Elk.) Ord.	4/10½	2/3	3/-	4/9
5/-	Ault & Wiborg Ord. ..	24/3	13/9	24/3	12/3†
5/-	„ „ New Ord.	12/6	12/3	—	12/6
£1	Avon India Rubber Ord.	42/-	27/-	36/3	38/9*
£1	„ „ „ 6% Pref.	18/6	17/3	17/6	17/6
10/-	Bakelite Ord.	23/3	17/-	22/3	22/9
£1	„ 6% Pref. ..	19/6	18/3	18/3	18/3
£1	Baker Perkins Ord. ..	45/7½	30/7½	45/-	45/-
4/-	Bank Bdg. Rubber Ord.	2/7½	1/6	2/-	2/-
5/-	Boake (A.) Roberts Ord.	18/6	9/-	13/-	13/-
£1	„ „ „ 5% Pref.	15/1½	13/9	13/9	13/9
4/-	Brammer H. Ord. ..	14/1½	9/-	14/-	14/-
5/-	Bridge, David Ord. ..	26/9	16/3	23/6	26/6
5/-	Bright, John Ord. ..	13/10½	8/9	9/6	10/-
2/-	Brit. Ind. Plas. Ord. ..	7/7½	4/9	7/6	7/6*
2/-	„ 10% (tax free) Pref.	5/9	4/8½	4/9	4/9
£1	British Xylonite Ord. ..	50/6	28/6	47/6	50/-
£1	„ „ 5% Pref.	15/6	14/-	14/9	14/9
5/-	BTR Ind. Ord.	13/3	9/4½	11/-	11/3
£1	„ „ 7½% Pref. ..	22/6	20/9	22/6	22/6
£1	Courtaulds Ord... ..	30/-	20/-	33/6	34/6
£1	„ 5% 1st Pref.	18/6¾	15/7½	16/3	16/6
£1	„ 6% 2nd Pref.	19/6	17/1½	19/6	19/7½
4/-	Cow, P. B. Ord... ..	6/0¾	3/6	5/9	6/-
£1	„ 5% Pref. ..	13/6	10/9	12/6	11/-
5/-	Dale, John Ord... ..	15/-	10/-	11/-	11/-
£1	„ „ 6% Pref. ..	15/6	13/-	15/6	15/7½
1/-	Dann mac Mfg. Ord. ..	5/6	2/6	5/4½	5/10½
10/-	De La Rue Ord. ..	33/3	20/9	32/6	32/6
£1	„ „ „ 3½% Pref.	11/9	10/-	11/-	11/-
6/8	Distillers Co. Ord. ..	27/-	15/9	25/6†	24/9
£1	„ „ 6% Pref...	20/10½	19/10½	20/-	20/6
£100	„ 5% Conv. Loan	£96½	£91	£93½	£93½
£100	„ 5½% Unsec. Loan	£93½	£87 7/16	£93	£93
10/-	Dunlop Rubber Ord. ..	26/7½	14/9	24/6	24/-
£1	„ 5½% Pref.	18/9	15/10	17/9	17/6
£100	„ 3½% 1st Debs.	£73	£67¾	£72½	£72½*
£100	„ 4½% 2nd Debs.	£81	£78	£79½	£79½

Par Value	Company	1958-59 High	Low	Jan 17	Latest
4/-	Ebonite Cont. Ord. ..	13/3	7/6	13/3*	13/3
£1	English China Clays Ord.	50/-	29/9	47/6	49/4½
£1	Goodyear Tyre 4% Pref.	12/9	12/-	12/6	12/6
5/-	Greeff Chem. Ord. ..	17/9	14/-	15/9	16/6
10/-	„ „ 5½% Pref.	8/-	7/9	8/-	8/-
4/-	Greengate & Irwell Ord.	7/0¾	4/9	5/3	5/3
1/-	Hunt & Moscrop Ord. ..	1/5	1/1½	1/3	1/3
£1	Imp. Chem. Ord. ..	38/-	28/3	35/9	35/6
£1	„ „ 5% Pref. ..	17/3	16/-	16/6	16/6
£100	„ 4½% Unsec. Loan	£87	£80	£87	£86
£100	„ 5½% Conv. Loan	£121	£99	£117½	£119½
1/-	Kleemann (O. & M.) Ord.	5/5½	2/6	4/6	4/9
£1	„ „ 6½% Pref.	16/3	15/-	15/6	15/-
2/-	Lacrinoid Prod. Ord. ..	2/-	1/5¾	1/6	1/6
5/-	Laporte Ind. Ord. ..	20/7½	13/7½	19/9	20/3
£1	„ „ 7½% Pref.	22/10½	21/10½	22/3	22/3
£1	Leyland & Birm. Rubber Ord.	74/6	41/-	71/3	73/9
£1	„ „ 6% Pref.	21/3	16/1½	16/10½	16/10½
2/-	London Rubber.. ..	13/1½	8/6¾	13/-	12/9
£1	„ 6% Red. Cum. Pref.	19/9	16/3	18/9	18/9
£1	McKechnie Bros. Ord.	45/-	32/6	45/-	45/-
£1	„ „ 'A' Ord.	44/6	30/-	44/6	42/6
£1	„ „ 6% Cum. Pref.	—	—	16/3	14/3
5/-	Monsanto Chem. Ord. ..	16/4½	13/-	15/9	16/-
£1	„ „ 3½% Pref.	12/6	11/-	12/-	12/-
£100	„ „ 6% Debs.	£104	£101½	£103	£103
£1	North British Rubber ..	—	—	15/3	15/3
2/-	RFD Ltd. Ord.	5/0¾	3/5½	4/4½	4/9
£1	„ „ 5½% Pref. ..	14/6	11/6	13/9	13/9
2/-	Rubber Imp. Ord. ..	15/-	6/-	7/-	6/6
2/-	„ „ 'A' Ord.	15/-	6/-	7/-	6/6
£1	„ „ 5% 1st Pref.	12/3	10/-	10/-	10/-
5/-	Rubber Reg. Ord. ..	—	—	11/6†	11/-†
4/-	Shaw Francis Ord. ..	15/9	9/9	15/7½	15/7½
2/-	Sussex Rubber Ord. ..	1/8	7½	1/7½	1/4½
5/-	Sutcliffe Speak. Ord. ..	7/4½	5/-	6/3	6/3
£1	Turner & Newall Ord. ..	73/9	52/-	73/1½	72/6
£1	„ „ 7% Pref.	24/-	22/1½	23/3	23/3
5/-	Universal Asbestos Ord.	17/-	8/0¾	14/10½	16/6
5/-	Viscose Dev. Ord. ..	10/7½	6/3	9/4½	10/7½
5/-	Warne William (Holdgs.) Ord.	11/10½	8/-	11/6	11/3

* Ex-dividend † Ex-cap.

Rubber Markets

LONDON

The recent firm trend in the London rubber market was reversed and there has been a fairly sharp reaction in prices during the past week. An all-round fall ranging to nearly a penny per lb. has been recorded with the Spot ⅞ of a penny down at 24⅜d. per lb. The setback followed the withdrawal of Russian buying in Singapore, the factor which has been the main reason for the recent advance in the commodity.

Latest prices are as follows:

No. 1 RSS Spot: 24⅝d.-24⅞d.

Settlement House:

March 24⅝d.-24⅞d.
April/June 25d.-25⅛d.
July/September 25⅛d.-25⅜d.
October/December 25¼d.-25½d.

No. 1 RSS cif basis ports:

February 24⅛d.-24⅜d.
March 24⅜d.-24⅞d.

Godown:

February 83⅜ Straits cents nominal.

LATEX

Centrifuged latex per gallon in drums, February / March shipment, 14s. 5d. seller, cif European ports. Spot, seller, 14s. 11d. Bulk, seller, 14s. 10d. Creamed, seller, 14s. Normal, seller, 11s. 2d.

SINGAPORE

The market was marked down at the outset on January 26 in sympathy with overseas advices, and then ruled quiet at the lower level. Lower grades were in small demand but offers were scarce. Factories were small buyers. In the afternoon lower grades continued in demand but with a slightly easier tendency buyers were inclined to withdraw. Factories continued buying at the lower levels. After-hours, the market was slightly easier.

Straits cents per lb., fob Malayan ports to open ports

	Close	Previous Close
No. 1 RSS, Feb...	86¼—86½	87¼—87½
Mar...	86½—86⅝	87½—87⅝
No. 2 RSS, Feb...	84½—85	85½—86
No. 3 RSS, Feb...	84 —84½	84⅝—85⅛
No. 4 RSS, Feb...	82¾—83½	83½—84
No. 5 RSS, Feb...	80 —81	80½—81½
No. 1 Spot ..	85⅜—85⅞	86½—87
No. 3 blanket, thick remilled, Feb. ..	78 —80	78 —80
No. 1 fine pale crepe, Feb. ..	88 —89½	88½—89½

Tendency: Slightly easier

Latex, native produce, 60% centrifuged, packed in rec. drums fob 172.20d. per gallon.

NEW YORK

The following prices ruled in New York on January 26:

DEALERS' PRICES

Ex-dock, cents per lb.

	Jan. 26	Previous
No. 1 RSS, Jan.	Deleted	30½b–30¼a
Feb.	30½b–30¾a	30⅜b–30¼a
Mar.	30½b–30¾a	—
No. 2 RSS, Jan.	Deleted	29⅞b–30a
Feb.	29⅝b–29¾a	29⅞b–30a
Mar.	29⅝b–29¾a	—
No. 3 RSS, Jan.	Deleted	29⅝b–29½a
Feb.	29⅝b–29½a	29⅝b–29½a
Mar.	29⅝b–29½a	—
No. 1 RSS, Spot	30⅜b–30½a	30⅛b–30⅜a
No. 3 amber blanket crepe, Feb.	27½b–27⅞a	27½b–27⅞a
No. 1 latex, thin crepe, Jan. ..	31n	31n
No. 1 latex, thick crepe, Jan. ..	—	30¼n

FUTURES—REX CONTRACT

	Close	Prev. Close
Jan. ..	30.25b–30.70a	30.25b–30.30a
March ..	30.50b–30.70a	30.45b–30.48a
May ..	30.40b–30.45a	30.35b–30.40a
July ..	30.40b–30.45a	30.35b–30.40a
Sept. ..	30.30b–30.40a	30.25b–30.35a
Nov. ..	30.20b–30.35a	30.20b–30.30a
Jan. ..	30.10b–30.25a	30.10b–30.25a

Sales: Six Tendency: Quiet

Rubber futures were steadier in light covering on January 26. Traders said that factories were buying more actively and dealers were covering their sales in the shipment market. Shipment offerings were well absorbed, with the undertone very steady.

CREPE RUBBER

The following prices ruled in New York on January 21:

Dealers' selling prices:	Cents per lb.
Sole crepe, standard grade 'A'	48 (48)
Thick crepe	32½ (32)

AMSTERDAM

The Amsterdam rubber market ruled as follows on January 26:

Guilders per kilo

No. 1 RMA	Jan. 26	Previous
January	2.46	2.46
February	2.46	2.46
March	2.46	2.46
Jan./March	2.46½	2.46½
April	2.49	2.49
May	2.49	2.49
June	2.49	2.49
April/June	2.49	2.49
July	2.51	2.51

Sales: Nil Tendency: Quiet

DJAKARTA

It was another quiet session on January 26, although some demand was noted for lower grades. The close was idle with export certificates quoted at 332 paid/buyer.

Rupiahs per kilo

Fob main ports:	Jan. 26	Previous
Spot No. 1 Priok ..	23.10b	23.30b
Spot No. 2 Priok ..	22.00b	22.20b
Spot No. 3 Priok ..	20.90b	21.05b
No. 1 fine pale crepe ..	22.00b	22.20b

Tendency: Idle

BANGKOK

No. 1 RSS

The price for No. 1 RSS, at Bangkok on January 26 was 27.62½ (27.75) US cents per lb.

CEYLON

No. 1 RSS

The price for No. 1 RSS, spot, at Colombo on January 26 was 106 (107½) Ceylon cents per lb.

STOCK MARKET

Continued from page 182

£731,000 which reduces the net profit to £348,000 against £564,000 last time. The final dividend is repeated at 10% which brings the total up to 15%.

Earnings on the ordinary are just sufficient to cover this dividend and the yield at the current price is around the 6½% mark.

The ordinary of the UNIVERSAL ASBESTOS firm succeeded in doubling their value from the low point of a year ago. They are now up to the region of 16s. 6d. The Cape Asbestos directors have recently announced that although the preliminary figures indicate that the year's profit will not be up to the 1957 record level they will be better than in 1956 and in all previous years. Ordinary shareholders are to be offered new shares on the basis of one-for-six at a price to be determined later. The directors anticipate that the final dividend for the current year will be maintained.

The THOMAS TILLING industrial group is teaming up with COMMERCIAL PLASTICS in a new company called MONDART. The object is to introduce to the United Kingdom a new range of aerosols. It has already been stated that the Commercial group will be introducing its shares to the market at some stage in the future. There are reports current in the City that this marketing, which will be a substantial affair, is very near.

Italian Rubber for Russia

Four thousand tons of synthetic 'europrene' rubber manufactured at the ANIC works at Ravenna, Italy, have been put on board the Soviet vessel Ljora at Ancona. This is the first shipment under a recent agreement between Russia and the ENI Statal Group which provides for an exchange of 8,000 tons of synthetic rubber for 800,000 tons of Russian crude oil. A second shipment of 4,000 tons of rubber will follow next month.

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An American company, Scientific Design Co., under agreement with Monsanto Chemicals Ltd., is to erect a new maleic anhydride plant at Newport, Mon. Production will be at 15m. lb. per annum and completion of the plant is scheduled for late 1960.

Industry INTELLIGENCE

Technical Data

Polyester Resin for Tropical Use

Cellobond A.2630 is a new general purpose polyester resin suitable for export to the tropics. The resin requires the addition of a reactive monomer before use and Cellobond monomer X.8840 is recommended for this purpose. Information on the resin/monomer mixture is given in Information Sheet No. X.P.116 issued by British Resin Products Ltd., Devonshire House, Piccadilly, London, W.1.

The procedure for using Cellobond A.2630 resin/monomer mixture is described in detail, including particulars of compounding, reinforcement, moulds and mould release agents, and the preparation of cold-setting and hot-setting mixes. Many fillers may be used to impart special properties and some suitable fillers are listed. Precipitated chalk is commonly used to extend the resin, render it opaque, and minimize shrinkage. Thixotropic properties are imparted to the resin/monomer mixture by addition of Cellobond X.9972, a special white silica powder. Thixotropic mixes are suitable for impregnating glass fibre reinforcing material used in open lay-up work.

Data are given for the properties of (a) Cellobond A.2630 resin; (b) a 70% solution of the resin in monomer X.8840; and (c) laminates prepared from the resin/monomer mixture. Laminates and casts made from the resin/monomer mixture have good physical and electrical properties and excellent resistance to ageing, weathering and chemical attack. The resin/monomer mixture is suitable for use in many processes including the open lay-up, vacuum bag, suction and pressure processes as well as the hot-setting matched metal mould technique.

Polystyrene Resistant to Ultra-Violet Light

The ordinary grade of Lustrex polystyrene is subject to some yellowing on exposure to light, radiation in the ultra-violet range, such as that emitted from fluorescent tubes in normal use, being specially active in causing yellowing. A light-resistant grade, termed Lustrex UVL, has therefore been developed for use in moulding diffusers, louvres and shades for fluorescent lighting assemblies. The resistance to yellowing of Lustrex UVL is due to the presence of a stabilizer and information on the properties of this grade of polystyrene is given in Laboratory Report No. LPI/1, Plastics 5811, issued by Monsanto Chemicals Ltd. (Plastics Division), Monsanto House, 10-18 Victoria Street, London, S.W.1.

Data presented in the report show that the UVL grade becomes yellow at approximately one-third the rate of unstabilized polystyrene. Lustrex UVL required over 10,000 hours continuous exposure to fluorescent light before the material had reached the maximum of yellowness which can be tolerated in light fittings. This period of exposure is equivalent to five years' use at a rate of 40 hours per week.

Machines, Materials and Equipment

Reinforcing Fillers

Mitek powdered cellulose is claimed to be the only powdered cellulose available with a coating—enabling high loadings to be made without difficulty. The particular grade recommended for the rubber industry is Mitek O2b (3), which is a fibrous filler with reinforcing qualities recommended for use in shoe soling compounds. In microcellular soling, it is said to minimize the after shrinkage, improve the stitch, tear, and split tear strength, and in extrusion compounds prevent swelling at the die. It is also used in tyre tread stocks for providing greater skid resistance. Mitek materials are also used as reinforcing fillers for melamine and urea-formaldehyde resins. The manufacturers are Mikro-Technik GmbH, Western Germany.

Hakuenka is a colloidal calcium carbonate with an average particle size between 0.02 and 0.03 microns. It has exceptional reinforcing properties in rubber compounds. Two grades are available, CC and DD, which are similar in their reinforcing properties in rubber and also tear, abrasion and flexing resistance. They are recommended for use in tyre treads, carcase stocks, tubes, belting, footwear, hot water bottles and compounds for general rubber goods. The manufacturers are Shiraishi Shoji Kaisha Ltd., of Japan.

Sole UK representatives are Croxton and Garry Ltd., 16-18 High Street, Kingston-on-Thames, who are also the sole representatives for the OMYA organization.

Rubber Reodorant

Included in the range of 'Alamask' odour control chemicals, made by May and Baker Ltd., Dagenham, Essex, are a number of compounds specially designed for overcoming the odours from various rubber products. Slight residual odours of a pleasant, neutral type, or more distinctive leather or floral odours may be imparted.

Effective reodorization of natural rubber is said to be readily achieved by the incorporation of one of these compounds, and successful modification or reductions in the odours of blown sponge and elasto-plastics have been obtained. In the latter application the reodorant is added with the plasticizer. Synthetic and reclaim rubber can also be treated. The concentration of reodorant normally employed is in the region of 0.01 to 0.2% dependent upon individual requirements.

Wing Nut Design

A new method for the manufacture of nuts has been developed by M. F. Robertshaw Ltd., Bletchley, Bucks. The principle consists of a thread form introduced into a pressed metal blank which takes the shape of a bisected wing nut; it is then folded, forming a nut which is consequently split into two halves, but tied at the top by the fold—the halving of the thread allows a tension to be exerted on the bolt itself. When tightening the bottom ends of the nut coincide with a cupped recess on the component to be fixed or, alternatively, an individual cupped washer which gives a collet effect, so giving a locking action of the two halves on to the thread. This principle whereby wing nuts with stiff and locknut properties are manufactured can be converted to other applications such as for light bolts, plastic inserts and various other uses.

Publications Received

Carbide Tipped Saws

Publication No. 213, January, of Firth Brown Tools Ltd., Sheffield, introduces the 'Speedicut Mitia' range of tungsten carbide tipped saws. The working capacities of the saws in the range, which are designed for *inter alia* cutting decorative and industrial plastics, are outlined, and their diameters and cutting widths, etc., tabulated.

'Black Knight' Plastics

Just released is the new 'Black Knight' Plastics Catalogue published by Tool Treatments (Chemicals) Ltd Colliery Road, Birmingham Road, West Bromwich. In the form of a price list it contains an interesting section dealing with the action of various chemicals on polythene.

Plastics Scrap

'Michael S. Stevens Ltd., Plastic Scrap,' a leaflet being circulated by the company, outlines the facilities available to the industry for scrap disposal. With its main factory at Hammersmith, the company also has a works at Putney.

Future Events

INSTITUTION OF THE RUBBER INDUSTRY

Manchester Section.—Monday February 9 at Newton Heath Technical College, at 6 p.m. 'Management and the Technologist,' by Dr L. Ridgeway, Phillips Rubber Manufacturing Ltd.

Merseyside Section. — Monday February 9 at the Exchange Hotel, Liverpool, at 7.15 p.m. 'Relative Performance of Rayon and Nylon in Passenger and Truck Tyres,' Courtaulds Ltd.

Midland Section.—Monday February 9 at the James Watt Memorial Institute, Great Charles Street, Birmingham, at 6.45 p.m. 'Making Use of Science in the Rubber Industry,' by J. M. Buist, B.Sc., F.Inst.P., F.I.R.I. (I.C.I. Ltd.), Dr W. C. Wake (RABRM), and Dr W. F. Watson (BRPRA).

Southern Section. — Thursday February 5 at the Chemistry Department, University of Southampton, at 7.30 p.m. 'Vinyl Chloride Polymers: their Design and Application,' by B. S. Dyer, I.C.I. Ltd. Joint meeting with the Southern Section of the Plastics Institute.

South Wales and Monmouthshire Section. — Monday February 9 at the Angel Hotel, Cardiff, at 7.30 p.m. 'Uses of Rubber in the Aircraft Industry,' by P. I. Brittain (De Havilland Aircraft Co. Ltd.).

PLASTICS INSTITUTE

London and District Section.—Tuesday February 3 at the Wellcome Building, 183-193 Euston Road, London, N.W.1, at 6.30 p.m. 'Some Aspects of the Financing of Export Trade,' by G. S. Wheldon, Midland Bank Overseas Branch.

North Western Section.—Friday February 6 at the Textile Institute, Blackfriars Street, Manchester, at 6.45 p.m. 'Plastics in the Shoe Industry,' by J. Bunten, M.A., British Boot, Shoe and Allied Trades Research Association.

Southern Section. — Thursday February 5 at the Chemistry Department, University of Southampton, at 7.30 p.m. 'Vinyl Chloride Polymers: their Design and Application,' by B. S. Dyer, I.C.I. Ltd. Joint meeting with the Southern Section of the Institution of the Rubber Industry.

Society of Chemical Industry, Plastics and Polymer Group. — Tuesday February 3 at the SCI Meeting Room, 14 Belgrave Square, London, S.W.1, at 6.30 p.m. 'Polymers and Derivatives of Phosphonitrile Chloride,' by Mr F. G. R. Gimblett, Royal Aircraft Establishment.

Latest Will

Mr Thomas Martin, of St. John's Lodge, 97 St. John's Avenue, Bridlington, Yorks., chairman of the Asbestos and Rubber Co. Ltd., who died on September 18 1958, left £36,853 gross, £34,345 net value. (Duty paid £7,241.)

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from "The Trade Marks Journal"—given below are reproduced by permission of the Controller of H.M. Stationery Office.

MONTOPORE (778,565) For plastics included in Class 1, and chemical compositions containing such plastics and being for industrial use. By Monsanto Chemicals Ltd., Monsanto House, 10-18 Victoria Street, London, S.W.1. To be associated with No. 757,455 and others. (Class 1; December 17 1958.)

SCOPRENE (781,281) For articles included in Class 17 made of plastics. By Robert Swann Dixon, 26 Jesmond Park West, Newcastle-on-Tyne. (Class 17; December 17 1958.)

KOLCRAFT

(778,688) For hardboard panellings, wallboards, non-metallic panels for affixing around the exteriors of baths and panels made of non-metallic materials coated with plastics for affixing to walls, all being enamelled goods; and enamelled hardboard in imitation of units of tiles. By Colourcraft Enamellers Ltd., Kolcraft Works, Honeybourne, Evesham, Worcestershire. (Class 19; December 17 1958.)

DURASOLID (776,737) For all goods included in Class 28 made of common metal and coated with rubber or plastics, the metal predominating. By Vacu-Lug Traction Tyres Ltd., Site 5, Gonerby Hill Foot, Grantham, Lincolnshire. (Class 28: December 17 1958.)

(775,620) For sink units made of plastics. By Henry Robinson (Fibres) Ltd., Stewkins Foundry, The Stewkins, near Stourbridge, Worcestershire. To be associated with No. 775,619 (4198, 1319) and another. (Class 19; December 23 1958.)

CRONAFLEX (775,629) For unsensitized transparent films of plastics or of paper, in sheet form, prepared for use in graphic reproduction processes. By E. I. Du Pont de Nemours and Co., 1007 Market Street, Wilmington, State of Delaware, United States. Address for service is c/o Marks and Clerk, 57 and 58 Lincoln's Inn Fields, London, W.C.2. To be associated with No. 746,753 (4064, 456) and others. (Class 16; December 23 1958.)

COMPLASTIC (781,099) For brushes included in Class 21 and brooms, all made of plastics. By Fredk. Coxson and Sons Ltd., Beehive Mills, Water Street, Stockport, Cheshire. (Class 21; December 23 1958.)

HARDEC (780,433) For composition boards made of comminuted wood, with a decorated plastic surface, for use in building and the manufacture of furniture. By The Airscrew Co. and Jicwood Ltd., Blackboy Works, Weybridge, Surrey. To be associated with No. 733,395 (3998, 40). (Class 19; December 23 1958.)

STAR

(778,428) For plastics in the form of foils, blocks, rods, bars, tubes and shaped sections, for use in manufacture. By Aktiebolaget Jönköping-Vulcan, Vastra Storgatan 18A Jönköping, Sweden. Address for service is c/o Trade Mark Owners Association Ltd., 50 Charing Cross (near Admiralty Arch), London, S.W.1. To be associated with No. 778,427 (4198, 1321) and others. (Class 17; December 23 1958.)

(766,011) For vehicle tyres, inner tubes for vehicle tyres, sealing rings for use with tubeless vehicle tyres, protectors for inner tubes of tyres; patching material (not being cement or rubber solution) and repair outfits, all for tyres; vehicle buffers; anti-vibration mountings and shock absorbers, all for vehicles; brake rubbers for vehicles; inflatable boats and inflatable rafts and valves being parts of such goods; and valves for vehicle tyres; all being goods wholly or principally of rubber. By Metzeler Gummiwerke Aktiengesellschaft, Westendstrasse 131-133 München 12, Germany. Address for service is c/o Marks and Clerk, 57 and 58 Lincoln's Inn Fields, London, W.C.2. (Class 12; December 23 1958.)

ROCKBUSTER (779,041) For rubber footwear (being articles of clothing). By J. Langdon and Sons Ltd., Langdon Buildings, Duke Street, Liverpool. (Class 25; December 23 1958.)

RUBLASTIC (782,127) For all goods included in Class 17. By Rubber Plastics Ltd., Upper Basildon, near Pangbourne, Berkshire. (Class 17; January 1 1959.)

PATENT LIST

Printed copies of the Specifications in the following list can be obtained from the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d., including postage, but about six weeks after the date of this publication will usually elapse before they come available. Orders with remittance may be sent in advance to the Patent Office, and will be fulfilled immediately the Specifications are published.

COMPLETE SPECIFICATIONS ACCEPTED

Open to public inspection on February 4 1959

Farbenfabriken Bayer A.G. Polyurethane plastics and method of making same. 808,574.

P. G. E. A. Vanlaer. Processes and apparatus for the manufacture, in single continuous operation, of a flexible sheet of reinforced plastic material. 808,433.

Soc. Industrielle de la Cellulose (S.I.D.A.C.) S.A. Film forming composition with plasticizer of terephthalamide derivatives. 808,366.

Farbenfabriken Bayer A.G. Process for the production of thermoplastic polycarbonates. 808,485.

Farbenfabriken Bayer A.G. Process for the production of thermoplastic polycarbonates. 808,486.

Farbenfabriken Bayer A.G. Process for the production of thermoplastic polycarbonates. 808,487.

Farbenfabriken Bayer A.G. Process for the production of high molecular weight polycarbonates. 808,488.

Farbenfabriken Bayer A.G. Process for producing polycarbonates. 808,489.

E. I. du Pont de Nemours and Co. Preparation of tetrafluoroethylene. 808,441.

American Cyanamid Co. Tows of polyacrylonitrile filamentary material and production thereof. 808,518.

John Bull Rubber Co. Ltd. Means and methods for repairing punctures in tubeless tyres. 808,388.

C. Vogt (trading as Vogt and Hartmann). Method and machine for shaping thermoplastic sheets. 808,389.

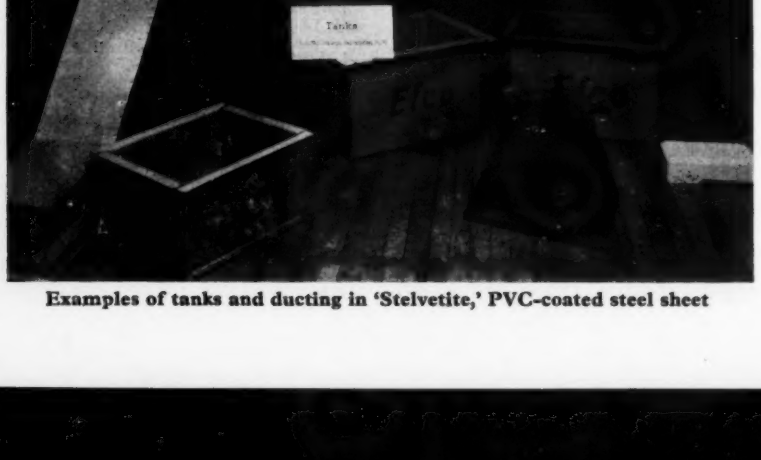
Beecham Research Laboratories Ltd. Ethynyl magnesium halides. 808,392.

Standard Oil Co. Treatment of viscous solutions of normally solid polymers and polymerization process embodying same. 808,327.

Stelvetite Exhibition

An exhibition of fabrication techniques and applications of Stelvetite, PVC-coated steel was held in London recently by the manufacturers, John Summers and Sons Ltd., of Shotton, Chester. Demonstrations included spot welding, high frequency welding, lock forming, printing and drum sealing.

All available colours and gauges of Stelvetite were shown with a large selection of the things now being produced in the material. As a matter of interest, the first vehicle ever to have an interior lining of plastic-coated steel has been produced by a Maidstone, Kent, bodybuilder. A Karrier ambulance, it is fitted with a composite wood/light alloy body, the roof, sides and rear doors being lined with white Stelvetite. Advantages include the fact that this material is completely hygienic, easy to clean and simple to manipulate with conventional body building tools.



Examples of tanks and ducting in 'Stelvetite,' PVC-coated steel sheet

NEW COMPANIES

Plastics for Industry Ltd. (616,261).—December 8. Capital: £100 in £1 shares. To carry on the business of manufacturers, moulders and fabricators of and dealers in plastics and plastic substances, compounds and synthetic products, etc. The directors are: Harold Franks and Miriam Franks, both of 53 Cavendish Road, Kersal, Salford, 7. Directors of Harold Franks and Co. Ltd., etc. Regd. office: 103/109 Church Street, Pendleton, Salford 6.

Midland Adhesive Co. Ltd. (616,548). — December 11. Capital: £500 in £1 shares. To carry on the business of manufacturers of and dealers in latex adhesives and compounds of all kinds, rubber and latex solutions, crepe soles, heels and protectors, Ltd. The directors are: Gerald F. Arnold, 1,293 Melton Road, Syston, Leicester; George W. Allen, 12 Dorothy Avenue, Thurmaston, Leicester. Regd. office: 4 New Walk, Leicester.

K. and C. Mouldings (England) Ltd. (616,579).—December 11. To carry on the business of fibre glass, glass, metal and plastic moulders, etc. The subscribers (each with one share) are: Suzanne Crowder, receptionist, and Margaret Couitrip, shorthand typist, both of 48 Conduit Street, London, W.1. The first directors are to be appointed by the subscribers. Solicitors: Spiro and Steele, 48 Conduit Street, London, W.1.

Foamair Ltd. (616,735).—December 15. Capital: £100 in £1 shares. To carry on the business of manufacturers of and wholesale and retail dealers in foam rubber and goods of all kinds, etc. Directors are: Leonard Raznick, 129 Ashford Court, London, N.W.2; Lewis Fox, 107 Green Lane, Stanmore, Middlesex. Regd. office; 2, Serjeants' Inn, London, E.C.4.

Plasniel Ltd. (616,835).—December 15. Capital: £100 in £1 shares. To carry on the business of manufacturers of and dealers in plastics, plastic modelling and moulding materials, etc. The directors are: George P. Cooper, 'Beechwood,' Bassett Wood Drive, Southampton, director of G. P. Cooper Ltd., etc.; and Peter O'Neill, 'Greenbanks,' Station Road, Fordingbridge. Regd. office: Ashford Mills, Station Road, Fordingbridge, Hants.

Polystyrene Imports Ltd. (616,852).—December 16. Capital: £1,000 in £1 shares. The permanent directors are: Harold C. Hernaman, Highfields, Chiltern Hill, Chalfont St. Peter; Henry Shakespeare, 38 Quinns Square, London, S.E.1; Laurence Caplin, 29 Chiddingfold, London, N.12. Regd. office: 196 Lambeth Walk, London, S.E.11.

Harrisons Woodworking Machines Ltd. (616,867).—December 16. Capital: £4,000 in 3,500 'A' and 500 'B' shares of £1 each. To carry on the

business of agents for the sale of, dealers in and repairers, servicers and manufacturers of machinery, planing, woodworking and plastic cutting machinery, etc. The permanent directors are: Harold T. Harrison, Glen Ford Works, Little Glen Road, Blaby, Leics.; George F. Daft, 71 Humberstone Drive, Leicester. Regd. office: Glen Ford Works, Little Glen Road, Blaby, Leics.

Lee Roy Ltd. (616,992).—December 17. Capital: £1,000 in £1 shares. To carry on the business of importers, exporters and manufacturers of and dealers in all kinds of footwear, leather and rubber goods, etc. The directors are: Le Roi Richman, 9 Highcroft, North Hill, N.6; Antony Richman, The Gables, Powell Close, Canons Drive, Edgware, Mdx. Regd. office: 14 Tooks Court, Cursitor Street, E.C.4.

GRP Mouldings Ltd. (617,278).—December 22. Capital: £100 in £1 shares. To carry on the business of manufacturers, producers and processors of and dealers in glass fibre and synthetic resin materials of all kinds, etc. The directors are: Stanley J. Compton, 126 Park Gate Road, Coventry, managing director of A. L. Dunn and Co. Ltd., etc.; Herbert E. Sturman, 17 Delaware Road, Coventry, director of Burbage Engineering Co. Ltd., etc. Regd. office: 16a Coventry Street, Coventry.

BR Plastics Ltd. (617,234).—December 22. Capital: £1,000 in £1 shares. To acquire the business carried on by BR Plastics. The directors are: Gerald J. Burtenshaw, 34 Mountfield Road, N.3; Charles H. Roberts, 5 Brunswick Court, Henry Road, New Barnet; Robert A. Raphael, 60 Crown Lane, N.14, all of whom are directors of Knight Electrics (Neon) Ltd. Regd. office: 54 Alsen Road, N.7.

I.C.I. (Hyde) Ltd. (617,414). — December 23. Capital: £100 in £1 shares. To carry on the business of manufacturers of and dealers in leathercloth, fabrics manufactured from natural yarns and synthetic fabrics of all kinds, etc. The subscribers (each with one share) are: Bernard J. W. Winterbottom and Malcolm J. Methven, both solicitors, of Imperial Chemical House, Millbank, S.W.1. Imperial Chemical Industries Ltd. shall be the sole director and manager of the company. Solicitors: J. W. Ridsdale, Imperial Chemical House, Millbank, S.W.1.

Rubber Journal and International Plastics CLASSIFIED ADVERTISEMENTS

APPOINTMENTS VACANT

6d. a word, Minimum 10/- Box 2/-

APPLICATIONS are invited for the position of rubber technologist/chemist of a South African company of rubber manufacturers. Applicants must be fully experienced and capable of working under own initiative. Practical experience in synthetic/natural rubber compounding, mill and process control essential. A knowledge of mechanical mouldings, heavy duty hose and rubber to metal lining advantageous. Applications, giving full details of age, marital state, qualifications and experience, should be addressed to the Manager, P.O. Box 1982, Johannesburg, South Africa. (227)

COMPANY require rubber technologist, young man, A.I.R.I. standard, preferably with some works or laboratory experience, capable of taking some responsibility. Good opportunity with progressive company for right type.—Andre Rubber Co. Ltd., Kingston By-Pass, Surbiton, Surrey. (233)

DEPARTMENTAL manager required for fibre glass production. Sound knowledge of fibrous glass properties, polyester and epoxy resins, together with practical experience in hand lay and machine production of transparent sheet. Salary according to experience; superannuation and sickness schemes in operation.—Box 231. (231)

EVODE LTD., of Stafford, and associate companies, have vacancies for graduate chemists for research and development problems connected with cement and concrete additives, bonding fluids, bitumen compounds, disinfectants and cleaners, mastics, synthetic rubber gap and joint sealing compounds . The scope and remuneration of this position will be determined solely by the applicant's qualifications and ability. Applications, which will be treated in complete confidence, should give details of age, education, experience and present remuneration, and should be addressed to:—The Managing Director, Evode Ltd., Stafford. (213)

HOSE foreman required for a large hose department in factory in the South of England. Good all round knowledge of machine and hand machine made hose required, and with ability to control all the labour involved, and work to schedules under production manager. A staff appointment with good prospects, pension scheme, etc. Our employees know of this advertisement. Supply full details which will be treated with the strictest confidence.—Box 228. (228)

JOHN DICKINSON AND CO. LTD. (paper makers and manufacturing stationers), having recently entered the pressure sensitive adhesive field, require assistant chemists for production control and development of their expanding range of products. Replies, treated in confidence, to:—The Manager, John Dickinson and Co. Ltd., Home Park Mills, King's Langley, Herts. (225)

APPOINTMENTS VACANT (continued)

MIDLAND SILICONES LTD. require a development chemist to investigate the properties of silicone rubbers and to develop new rubbers. The man appointed should possess at least two years' experience in the rubber or plastics industries and have either a degree in chemistry or A.I.R.I. qualification. Age range 25-32. The department in which this vacancy lies is rapidly expanding and there are good prospects of advancement in the technical staff of this growing company. Good commencing salary. Pension and housing schemes are in operation. Please apply to the Staff Officer, Albright and Wilson (Mfg.) Ltd. (with whom Midland Silicones Ltd. is associated), P.O. Box 3, Oldbury, Birmingham. PLEASE QUOTE REF. NO. 522. (224)

Rubber Technologists

NORTH BRITISH RUBBER and U.S. RUBBER OF AMERICA

are continuing the expansion of their production facilities at Castle Mills, Edinburgh, and require two Rubber Technologists, one with experience in Rubber and Plastics Spread Coating and one for Extrusions and Windscreen Sections for the Automotive Industry. Re-organization provides ample scope for initiative and rapid promotion for men capable of rising to senior positions. Salaries will be commensurate with experience and potential and will be attractive to suitable candidates. Company benefits include Contributory Superannuation Scheme and Free Life Assurance. Applications, marked R.T., giving full details of qualifications, experience and age, should be addressed to Industrial Relations Division, The North British Rubber Co. Ltd., P.O. Box 47, Castle Mills, Edinburgh 3. (222)

APPOINTMENTS VACANT
(continued)

PRODUCTION supervisor required for London rubber manufacturers, to control extruding department. Experience and a sound knowledge of extruded tubing and mechanical products is essential. Applicants possessing initiative, ability to organize, with an understanding of works study and practical approach to production problems will only be considered. Write stating age, salary required and details of previous experience. All applications strictly confidential.—Box 215. (215)

RUBBER technologist/engineer required to take charge of production and assist in the development of butyl and other synthetic rubber compounds, extrusions, etc. A long experience in the trade is essential. Please write, giving full particulars of past experience, to:—The Technical Director, T. and W. Farmiloe Ltd., 88 Nine Elms Lane, Battersea, S.W.8. (223)

AGENCIES and REPRESENTATIVES
6d. a word, Minimum 12/6 Box 2/-

GREENGATE AND IRWELL RUBBER CO. LTD., have a vacancy in their coated textile department for a representative for the North of England. A good general knowledge of textiles is called for and some knowledge of natural and synthetic rubbers and plastics would be an advantage. Apply in confidence to:—The Personnel Officer, Greengate and Irwell Rubber Co., Ltd., Manchester, 3. (232)

TECHNICAL sales representatives. Applications invited from men of good education with some chemical or technical background for positions in sales organization of company manufacturing PVC pastes and compounds. After period of training, selected applicants will be appointed as outside sales representatives in London areas in which wide connexions are already established. The openings offer excellent prospects of progressive careers in an expanding organization to keen and conscientious men. Some experience in PVC or allied industry will be an advantage. Contributory pension scheme and free life assurance in operation Applications in writing, giving details of age, education and experience, to: RP/VSD, Vinatex Ltd., Devonshire Road, Carshalton, Surrey. (226)

ARTICLES FOR SALE (SECONDHAND)
6d. a word, Minimum 12/6 Box 2/-

DAVID BRIDGE 6in. heavy duty rubber strainer, complete with 75 h.p. motor and starter.—Ward and Goldstone Ltd., Salford 6, Lancs. (219)

3,000-TON belting press for Brammer and similar precision sheeting, platens 13ft. x 4ft. 2,000-ton 6-daylight platen press, platens 12ft. 6in. x 7ft. 9in., with self-contained pump unit. 1,000-ton 5-daylight press, platens 6ft. x 4ft.—Reed Brothers (Engineering) Ltd., Replant Works, Woolwich Industrial Estate, London, S.E.18. Telephone: Woolwich 7611/6. (220)

ARTICLES WANTED
6d. a word, Minimum 12/6. Box 2/-.

LATEX foam off-cuts urgently required—also plastic scrap, all grades, handbag, raincoat, polythene, etc.—Box 22

WANTED, micro and resin rubber waste, in black and coloured.—Box 169. (16

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